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(71) Applicant *(for all designated States except US)*: ITT MANUFACTURING ENTERPRISES, INC. [US/US]; 1105 North Market Street, Wilmington, DE 19801 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: BRICAUD, Hervé [FR/FR]; 166, avenue Eisenhower, F-39100 Dole (FR). PIZARD, Yves [FR/FR]; 106, avenue Georges Pompidou, F-39100 Dole (FR).

(74) Agent: KOHN, Philippe; Cabinet Philippe Kohn, 30, rue Hoche, F-93500 Pantin (FR).

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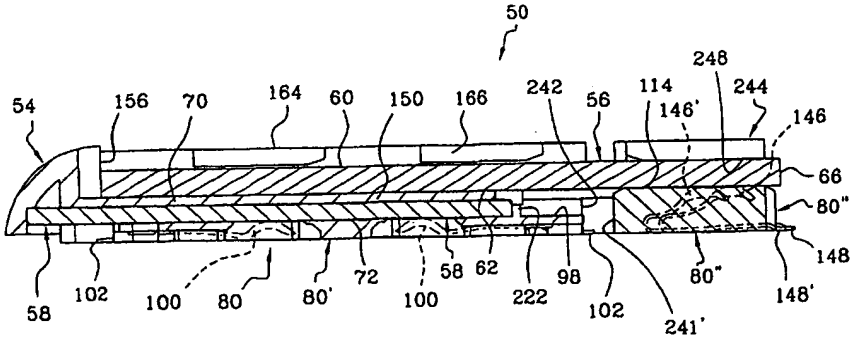

(57) Abstract

The invention provides an electrical connector (50) for the connection of at least two cards (56, 58) which include an upper card (56), of the type having a connector body (80) and a card-holder charger (54) which includes an upper compartment of receiving the upper card (56) and which is mounted so as to be able to move, by longitudinal sliding, between an out position, in which each card may be put into its compartment, and an operating position, in which the contact pads on each card (56, 58) engage with associated electrical-contact elements (100, 146) on the connector body, characterized in that the card-holder charger (54) includes a lower compartment for receiving a contact-type smart card (58) in that, in the operating position, the contact pads on the lower card (58) engage with associated electrical-contact elements (146) on the connector body and in that means are provided for positioning each card (56, 58) with respect to the card-holder charger (54) and for placing the charger (54) in the operating position.

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"Electrical connector for the simultaneous connection of two electronic-memory cards"

The present invention relates to an electrical connector for the simultaneous connection of two cards, each of which includes at least one integrated circuit and, on one of its main large faces, electrical-contact pads for connecting the card to an electronic circuit, especially to a circuit belonging to a read and/or write device making use of data contained in one or both cards.

A first known type of card, also called a smart card, is standardized in two formats, the smaller of which, also called a MICROSIM card, is commonly used in mobile telephone applications, this smart card especially including data relating to the identification of a user for the purpose of allowing him access to a telephone network. This first type of smart card is covered by a standard. This standard defines the dimensions of the card, i.e. the dimensions of its body forming the support for its chip, as well as the precise positions of the contact pads on the card.

A second known type of card, also standardized, is used especially for storing a large amount of data and thus constitutes a small removable data medium of high storage capacity. Several embodiments of such a type of memory card, also called a "flash" card, the dimensions of which are becoming smaller and the storage capacity of which is becoming greater, are known.

This is especially the case with the so-called MMC (MultiMediaCard) card sold by the company SanDisk, the dimensions of whose body containing the integrated circuits and the positioning of its contact pads are specifically defined by its manufacturer and by an association of users so as to have a standardized-type definition of such a card.

This definition forms the subject, for example, of the publication MultiMediaCard System Specification Version 1.4 Official Release @ February 1998 MMCA.

This second type of MMC card is generally similar in its shape and size to a MICROSIM card, especially in that it includes polarizing means for correctly and unambiguously positioning it in a connector and/or in a read/write device, which consists of a cut corner formed at one of the corners of the body of the card, which is generally rectangular in shape. On the other hand, the electrical-contact pads on the MMC card consist of a series of adjacent pads which are aligned along a short transverse edge of the card whereas, in the case of the MICROSIM card, the contact pads are grouped together into a block or bank of pads which is arranged generally centrally in the form of two series of pads which are aligned so as to be parallel to one of the short transverse edges of the card.

Whatever the type of card, it is necessary, in order to be able to use the data contained in the card, for example by means of a data exploitation circuit belonging to an apparatus making use of the contents of the memory of the card, to provide means of connection between the integrated circuit(s) of the card and an electronic circuit for reading the data contained in the card and/or for writing thereto.

In order to increase the performance of many electronic apparatuses, especially mobile telephones, it will be necessary from now on to give them large storage capacities in the form of a removable memory medium, especially in the form of a card of the MMC type.

Each apparatus must therefore have connection means allowing its main electronic circuits to be simultaneously

connected to two removable cards, especially to a MICROSIM card and to an MMC card.

The object of the present invention is to provide a novel design for a single connector which can be used simultaneously to install and connect the two cards and/or, depending on the application, at least one of the two cards, especially the MICROSIM card.

The connector must, for the person using the apparatus, be simple and ergonomic to use, guaranteeing that the cards are put in correctly and it must also be small so as not to increase the size of the apparatus and not to occupy too large an area on the printed-circuit board of the apparatus, the connector being fixed to this board which also carries other electronic components of the apparatus.

To this end, the invention provides an electrical connector for the connection of at least two cards which include a contact-type flash card of rectangular general shape, of the type having a connector body and a card-holder charger which includes an upper compartment for receiving the upper card and which is mounted so as to be able to move, especially by longitudinal sliding, with respect to the connector body between an out position, in which each card may be put into its compartment or extracted from the latter, and an operating position, in which the contact pads on each card engage with associated electrical-contact elements on the connector body, characterized in that the card-holder charger includes a lower compartment for receiving a contact-type smart card of rectangular general shape, in that, in the operating position of the card-holder charger, the contact pads on the lower card engage with associated electrical-contact elements on the connector body and in that means are

provided, on the one hand, for positioning each card with respect to the card-holder charger and, on the other hand, for placing the card-holder charger in the operating position with respect to the connector body.

According to other characteristics of the invention:

-the two compartments - the upper compartment and the lower compartment - are separated vertically by a horizontal intermediate partition the upper face and lower face of which form the respective lower and upper bottoms of the upper and lower compartments;

-each compartment is bounded longitudinally rearwards by a rear transverse edge of the compartment and each of the cards is retained longitudinally without any clearance in its compartment by at least one retaining spur on a front end transverse edge of the intermediate partition;

-each card is retained vertically in its compartment into which it has been put by inserting it longitudinally from the front to the rear;

-the card-holder charger can be detached from the connector body;

-the card-holder charger is mounted in the operating position on a lower part of the connector body by bayonet-type mounting means with a longitudinal locking movement of the card-holder charger from the rear to the front at the end of mounting;

-the upper card is a card of the MMC type while the lower card is a MICROSIM card with its lower face bearing the electrical-contact pads;

-the face of the MMC upper card which is oriented vertically upwards bears the electrical-contact pads which are aligned along the front end transverse edge of this card;

-the upper compartment or the lower compartment, respectively, is at least partially open facing the contact pads on the card that it receives;

-the face of the MMC upper card which is oriented vertically downwards bears the electrical-contact pads which are aligned along the front end transverse edge of this card;

-the upper compartment and the lower compartment are at least partially open vertically downwards, each facing the contact pads on the card that it receives;

-the cut-corner polarizing means on the MMC card engage with complementary means on the connector body in order to prevent the card-holder charger from occupying its operating position if the MMC upper card is not put into its compartment correctly;

-the cut-corner polarizing means on the MICROSIM lower card engage with complementary means formed in its compartment in order to prevent complete longitudinal insertion of the card into its compartment, the MICROSIM card then preventing the card-holder charger from occupying its operating position.

-the connector body includes a lower part in a general form of a plate made of insulating material which bears the electrical-contact elements for connection to the contact pads on the lower card;

-the bayonet means come into play between the card-holder charger and a rear part of the lower part of the connector body;

-the connector body includes an upper part in the form of a plate made of insulating material which bears the electrical-contact elements for connection to the contact pads on the MMC upper card;

-the connector body includes a vertical and transverse rear end wall which extends between the upper part and the lower part and which connects them together;

-the connector body is made of two pieces moulded independently and then joined together, the first piece of which includes the lower part and the second piece of which includes the upper part and the vertical linking wall;

-the electrical-contact elements for connecting the contact pads on the MMC upper card are electrical-contact blades whose rear free contact ends project vertically downwards and whose front free ends for connection to the printed-circuit board which bears the connector body extend approximately vertically in line with the front free ends for connecting the electrical-contact blades belonging to a front series of blades for connection to the contact pads on the MICROSIM lower card;

-the lower part of the connector body includes a rear part and a front part which are joined together, the rear part bears the electrical-contact elements for connection to the contact pads on the lower card and the front part bears the electrical-contact elements for connecting the connector to the contact pads on the MMC upper card that is oriented vertically downwards;

-the connection ends of the electrical-contact elements for connecting the conducting pads on the upper card are arranged longitudinally towards the front;

-the connection ends of the electrical-contact elements for connecting the conducting pads on the upper card are arranged longitudinally towards the rear;

-the electrical-contact elements for connecting the contact pads on the MMC upper card include free contact

ends, at least one of which is longitudinally offset towards the rear.

Further characteristics and advantages of the invention will appear on reading the detailed description which follows, for the understanding of which reference will be made to the appended drawings in which:

-Figure 1 is a three-quarter perspective view, from the rear and from above, of the body of the connector according to the invention;

-Figure 2 is a view similar to that in Figure 1 in which the card-holder slide-in unit has been shown in the approach position for the purpose of inserting it into the connector body;

-Figure 3 is a view similar to those in Figures 1 and 2, in which the card-holder slide-in unit is shown in the operating position in the connector body with its two cards in the connection position;

-Figure 4 is a top view of the connector in Figure 3;

-Figure 5 is a bottom view of the connector in Figure 3;

-Figure 6 is a view in longitudinal section on the line 6-6 in Figure 4;

-Figure 7 is a view similar to that in Figure 6, in which the connector is illustrated without the cards;

-Figure 7a is a view similar to that in Figure 6, in which the connector is illustrated without the card-holder slide-in unit;

-Figure 8 is a view in cross section on the line 8-8 in Figure 6;

-Figure 9 is a view in three-quarter perspective, from the front and from above, of the card-holder slide-in unit which is illustrated without any card;

-Figure 10 is a view in three-quarter perspective, from the front and from below, of the card-holder slide-in unit illustrated in Figure 9;

-Figure 11 is a view similar to that in Figure 9, in which the MMC upper card is illustrated during its longitudinal insertion into the corresponding upper compartment of the card-holder slide-in unit;

-Figure 12 is a view similar to that in Figure 10, in which the MICROSIM lower card is illustrated in the approach position for the purpose of inserting it longitudinally into the associated lower compartment of the card-holder slide-in unit;

-Figure 13 is a view similar to that in Figure 9, in which the card-holder slide-in unit is illustrated with the two cards, each in position in its compartment;

-Figure 14 is a perspective view from below of the card-holder slide-in unit illustrated in the previous figure;

-Figure 15 is a view in three-quarter perspective, from the rear and from below, of the connector body illustrated in Figure 1;

-Figure 16 is a view in three-quarter perspective, from the front and from above, of the connector body illustrated in Figure 1;

-Figure 17 is an end view of the front end of the connector body illustrated in Figure 1 with the card-holder slide-in unit in position in the connector body;

-Figure 18 is a perspective view similar to that in Figure 16, in which the connector is illustrated with its card-holder slide-in unit in the operating position in the connector body;

-Figure 19 is a view in three-quarter perspective, from the rear and from above, of the lower part of the connector

body, including especially the lower contact elements for connecting the MICROSIM lower card;

-Figure 20 is a view in three-quarter perspective, from the rear and from below, of the lower part of the connector body illustrated in the previous figure;

-Figure 21 is a view in three-quarter perspective, from the rear and from above, of the upper part of the connector body, including especially the upper contact elements for connecting them to the MMC upper card;

-Figure 22 is a view in three-quarter perspective, from the rear and from below, of the lower part of the connector body illustrated in the previous figure;

-Figure 23 is a large-scale view from below, which illustrates the front portions of the two cards in the relative position that they occupy in the card-holder slide-in unit;

-Figure 24 is a diagram illustrating the positioning, on a printed-circuit board, of the tracks for connecting the connection ends of the electrical-contact elements of the connector and the contact points between the contact ends of the electrical-contact elements and the contact pads on the cards;

-Figure 25 is a view similar to that in Figure 1, which illustrates a second embodiment of the body of a connector according to the invention essentially consisting of a lower part made of two complementary parts – a rear complementary part and a front complementary part, joined together by longitudinal interlocking;

-Figures 25A and 25B are details in cross section on the lines A-A and B-B in Figure 25;

-Figure 25C is a bottom view of the card-holder slide-in unit associated with the connector in Figure 25;

-Figure 25D is a detail on the line D-D in Figure 25C;

-Figure 26 is a view similar to that in the preceding figure, which illustrates only the front part of the lower part of the connector body in Figure 25;

-Figure 27 is a view on a larger scale of the detail D27 in Figure 26;

-Figure 28 is a partial sectional view, on a horizontal mid-plane and on a larger scale, of the connector body in Figure 25, which illustrates in greater detail the means of longitudinal interlocking assembly of the two, front and rear, parts of the connector body and the means which hold these two parts joined together;

-Figure 29 is a detail on a larger scale in the direction of the line F29 in Figure 26;

-Figure 30 is a view similar to that in Figure 25; which illustrates only the rear part of the lower part of the connector body in Figure 25;

-Figure 31 is a view similar to that in Figure 7A, which illustrates the connector support in Figure 25 in longitudinal section;

-Figure 32 is an end view of the front end of the connector support in Figure 25;

-Figure 33 is a view similar to that in Figure 11, which illustrates a second embodiment of the card-holder slide-in unit associated with the connector support in Figure 25;

-Figure 34 is a view similar to that in Figure 33, in which the MMC card is illustrated in the position in which it is entirely inserted into its compartment;

-Figure 35 is a view similar to that in Figure 25C, which illustrates the second embodiment of the card-holder slide-in unit in Figure 34 with the MICROSIM lower card illustrated in

the approach position for the purpose of inserting it longitudinally into the lower compartment of the card-holder slide-in unit;

-Figure 36 is a view similar to that in Figure 14, which illustrates the second embodiment of the card-holder slide-in unit with its two cards in position in their respective compartments;

-Figure 37 is a view similar to that in Figure 7, which illustrates the connector according to the second embodiment of the invention;

-Figure 38 is a view similar to that in Figure 17, which illustrates the second embodiment of the connector according to the invention;

-Figure 39 is a view from above, on a large scale, of the front portion of the connector according to the second embodiment with the card-holder slide-in unit in the operating position with its two, MMC and MICROSIM, cards;

-Figures 40 and 41 are the two parts of a diagrammatic longitudinal sectional view of the connector in Figure 39;

-Figure 42 is a view similar to that in Figure 23, which is a partial view, from below, of the associated two cards in the connector according to the second embodiment;

-Figure 43 is a view similar to that in Figure 24 for the second embodiment of the invention;

-Figures 44 to 55 are views similar to those in Figures 25, 26, 30 to 32 and 37 to 43, respectively, which illustrate a third embodiment of a connector according to the invention;

-Figures 56 and 57 are views similar to those in Figures 36 and 44 which illustrate a first alternative form of a connector according to the third embodiment;

-Figure 57A is a detail in section on the line A-A in Figure 57, which illustrates the card-holder slide-in unit in the process of being put into place by snap-fastening;

-Figure 57B is a view similar to that in Figure 57A, which illustrates the slide-in unit in the snap-fastened position;

-Figures 58 to 60 are views similar to those in Figures 34, 44 and 49, respectively, which illustrate a second, low-profile, alternative form of a connector according to the third embodiment with a smaller overall height;

-Figure 61 is a view similar to that in Figure 25, which illustrates an alternative form of a connector according to the second embodiment, which includes a switch, of the normally-open type, for detecting the presence of the MICROSIM card and elements belonging to means for detecting the presence of the MMC card;

-Figure 62 is a view from above, on a large scale of the detail of the switching blade of the switch for detecting the presence of the MICROSIM card in Figure 61;

-Figure 63 is a partial longitudinal sectional view on the line 63-63 in Figure 61, which illustrates the switch with the card-holder slide-in unit present but with the MICROSIM card absent;

-Figure 64 is a view similar to that in Figure 63, which illustrates the switch with a MICROSIM card present in the card-holder slide-in unit;

-Figures 65 to 68 are views similar to those in Figures 61 to 64, which illustrate an alternative form, of the normally-closed type, of the switch for detecting the presence of the MICROSIM card;

-Figure 69 is a view similar to that in Figure 36, which illustrates an alternative form of the card-holder slide-in unit,

including elements, complementary to those of the connector body illustrated in Figures 61 and 65, for forming the said means for detecting the presence of the MMC card;

-Figure 70 is a partial longitudinal sectional view on the line 70-70 in Figure 65, which illustrates the switch with the card-holder slide-in unit present but with the MMC card absent;

-Figure 71 is a view similar to that in Figure 70, which illustrates the switch with an MMC card present in the card-holder slide-in unit;

-Figure 72 is a view in three-quarter perspective, from below, of a card-holder slide-in unit, also called a card-holder charger, associated with the connector body illustrated in three-quarter perspective, from the rear and from above, in Figure 73, in order to form a fourth embodiment of the invention;

-Figures 74 and 75 are views similar to those in Figures 72 and 73, which illustrate a fifth embodiment of the invention; and

-Figure 76 is a sectional view on the line 76-76 in Figure 74.

In the description which follows, identical, similar or analogous components and elements will be denoted by the same reference numbers.

The terms front, rear, vertically, horizontally, upper, lower, etc., will be used with reference to the appended drawings for the purpose of simplifying the description and the claims and to make them easier to understand.

A first embodiment of the invention, illustrated in Figures 1 to 24, will now be described.

As may be seen in Figure 2, the electrical connector 50 according to the invention essentially consists of a connector

body 52 and of a card-holder charger 54 in the form of a slide-in unit which is intended to hold one or two cards having integrated circuits, especially a card 56 of the MMC type and a card 58 of the MICROSIM type.

The MMC card 56 is of a known and standardized general design and has a rectangular general shape comprising a first plane large face 60, this being an "inert" face which, in the first embodiment, will be the lower face of the MMC card 56, and an upper opposite second plane large face 62, this being the "active" face which carries the contact pads 64 which are aligned longitudinally near the front end transverse edge 66 of the card, there being seven of these pads here (see especially Figure 23).

The MMC card 56 includes, in its front end edge 66, a 45° cut corner 68 for polarizing the orientation of the card.

Likewise, and as may be seen especially in Figures 12 and 23, the MICROSIM card 58 is of known and standardized general design and is of a rectangular general shape having a first plane large face 70, this being an "inert" face which is the lower face of the MICROSIM card 58, and an upper opposite second plane large face 72, this being the "active" face which carries the contact pads 74 which are aligned longitudinally in four pairs whose standardized positions are defined with respect to the rear transverse edge 77 which has the cut corner 78 for polarizing the orientation of the card.

The connector body 52 illustrated in the figures is produced by moulding two parts – the lower part 80 and the upper part 82 – in an insulating plastic, these parts being produced separately and then joined together.

As may be seen especially in Figures 19 and 20, the lower part 80 is a piece in the form of a plate forming a support

for the electrical-contact elements 84 of known general design for electrical connection to the contact pads 74 on the MICROSIM card 58.

The lower part 80 is thus bounded by a plane lower face 86 intended to bear against a facing face of a printed-circuit board P (shown in Figure 24) belonging, for example, to a device for exchanging data with the memories formed by the integrated circuits of the MMC card 56 and the MICROSIM card 58.

The lower part 80 is also bounded by a parallel plane upper face 88 forming the bearing and mounting face for the upper part 82. For this purpose, the lower part 80 has four vertical through-holes 90 which are arranged in pairs near the lateral edges 92 and 94 and close to the front transverse edge 96 of the lower part 80.

The plane upper face 88 has, in its central part, and over the entire length, a recess which is bounded vertically downwards by a horizontal plane face 98 from above which project, vertically upwards, the contact ends 100 of the contact elements 84.

In a known general manner, each contact element 84 has a connection end 102 (for connection to a conducting track on the printed-circuit board P) which is bent so as to extend approximately in the plane of the lower face 86 close to the front transverse edge 96 and to the rear transverse edge 97.

The horizontal face 98 forms a bearing face for the lower face 72 of the MICROSIM card 58 when the latter is in position in the connector 50.

On each side of the bearing face 98, the lower part 80 has two rails or grooves 109 for bayonet mounting of the card-holder slide-in unit 54. Each groove 104 is bounded

downwards by a bottom 106 and upwards by two tabs 108. Each groove 104 is open and chamfered at its rear end and closed by a transverse stop face 110 at its front end.

The upper part, illustrated especially in detail in Figures 21 and 22, also essentially consists of an upper piece in the form of a plate 112 which is bounded vertically by a lower plane face 114 and by an upper plane face 116. Near the rear transverse edge 118 of the plate 112, the lower face 114 has a chamfer 120 for insertion of the card-holder slide-in unit 54.

At its front end, the upper part 82 has a transverse vertical wall 112 which extends vertically downwards from the lower face 114.

Laterally, the upper part 82 has two vertical and longitudinal walls 124 and 125, each of which is extended, in its lower part, transversely outwards by a horizontal tab 126, 127 for the upper part 82 to bear on and be fixed to the lower part 80.

For this purpose, the horizontal lower faces 128 of the tabs 126, 127 are coplanar in order to bear vertically on the corresponding parts of the horizontal upper face 88 of the lower part 80, each of them having a pair of positioning and fixing studs 130, each of which is designed to be taken through a corresponding hole 90 in the lower part 80 and the lower free end 132 of which is used to fix the two parts 80 and 82 definitively, by hot crimping.

The upper face 134 of the horizontal tab 126 has, at its rear end, a thinned part which defines an upper facet 136 that is offset vertically downwards and bounded longitudinally forwards by a vertical transverse facet 138.

The longitudinal wall 125 is extended at its rear longitudinal end by a vertical wall 140, the internal face of

which is inclined at 45° so as to form an internal polarizing facet 142 intended to engage with the cut corner 68 of the MMC card 56 (see Figure 21).

The upper part 82 in the form of the upper plate 112, in the same way as the lower part 80, bears electrical-contact elements 144 whose curved free contact ends 146 project vertically downwards below the lower face 114, the latter forming a horizontal bearing face for the facing upper face 62 of the MMC card 56.

The front free connection ends 148 of the flexible electrical-contact blades 144 are bent vertically downwards along the corresponding part of the front external face 123 of the vertical wall 122 so as, as may be seen especially in Figures 15 to 18, to extend in the same horizontal plane as the connection ends 102 of the electrical-contact elements 84, i.e. approximately in the plane of the lower face 86 of the lower part 80.

As may be seen especially in Figures 5, 16 and 18, and this being in accordance with the standardization of the method of connecting the MMC card which requires two special contact pads to be connected to a power supply before the other pads are connected, two contact ends 146' are offset longitudinally rearwards with respect to the contact ends 146 of the other five contact elements 144 and in the same manner their associated connection ends 148' are offset longitudinally rearwards with respect to the other five connection ends 148.

In order to use electrical-contact elements 144 all seven of which are identical, the vertical partition 122 has a central part 122' which is offset longitudinally rearwards.

As may be seen specifically in Figures 4 and 5 and Figures 23 and 24, the transverse distances separating the

standardized contact pads 64 on the MMC card 56 and 74 from the MICROSIM card 58 are such that it is possible to interpose the two central connection ends 148' of the MMC card between three connection ends 102 of the electrical-contact elements 84 of the front row of the lower part 80 and to longitudinally align these two ends 148' with the three ends 102 between which they are interposed by offsetting longitudinally rearwards (see Figures 4 and 5) this group of five connection ends with respect to the other five connection ends 148 which themselves are aligned and offset longitudinally forwards.

The card-holder slide-in unit 54 will now be described in detail with reference especially to Figures 9 to 14.

The card-holder slide-in unit 54 is a moulded plastic component which essentially consists of a horizontal plate 150 forming a horizontal partition that separates an upper compartment 152 intended to house the MMC upper card 56 from a lower compartment 154 intended to house the MICROSIM lower card 58.

The upper compartment 152 is generally longitudinally open to the front and is bounded to the rear by a vertical transverse wall 156 having a convex housing 158 in the form of a cylindrical arc, intended to make it easier to extract the MMC card 56.

The upper compartment 152 is bounded transversely by two vertical and parallel longitudinal walls 160 whose facing internal faces 162 form lateral faces for guiding the MMC card 56 longitudinally, the longitudinal and parallel edges 57 of which are thus guided, in longitudinal sliding, when the MMC card 56 is inserted from the front to the rear, i.e. along the direction indicated by the arrow I in Figure 11.

In order to provide vertical retention of the MMC card 56 in its upper compartment with its face 60 bearing against the upper face 151 of the separating partition 150, each of the side walls 160 has, in its upper face 164, two retaining tabs 166 which extend transversely inwards and the lower faces 168 of which are intended to engage with the facing portions of the upper face 62 of the MMC card 56.

In order to make it easier to insert the MMC card 56 into its compartment 152, the front longitudinal ends 170 of the internal faces 162 of the side walls 160 each have a chamfer 172.

The partition 150 is bounded longitudinally forwards by a front transverse edge 174 and it is extended longitudinally forwards in its central part, beyond the front transverse edge 174, by a transversely narrower portion 176 which has a convex circular cut-out 178 in order to make it easier to grip the cards and which, on its upper face, has two thicker regions 180 each of which defines a transverse stop facet 182 that is intended to engage with the front transverse edge 66 of the MMC card 56 in order to provide longitudinal retention in its compartment 152.

As may be especially seen in Figure 13, in the position in which the MMC card 56 has been inserted into its compartment 152, the front transverse edge 66 of the MMC card 56 extends longitudinally forwards beyond the transverse edge 174 of the partition 150, particularly so that its cut corner 68 is "free" to engage with the inclined vertical polarizing facet 142, as will be explained below.

Likewise, the lower compartment 154 intended to house the MICROSIM card 58 is bounded transversely by two longitudinally oriented, opposed and parallel, vertical walls 184

which extend vertically downwards, the internal lateral face 186 of each wall 184 forming a guiding face, along which the MICROSIM card 58 slides, and being intended to engage with a longitudinal facing edge 59.

Each of the vertical walls 184 has an internal chamfer 188 intended to make it easier to insert the MICROSIM card 58.

The compartment 154 is bounded longitudinally rearwards by a transverse vertical wall 191 whose internal vertical face 193 has a facet 194 inclined at 45° and intended to engage with the cut corner 78 for polarizing the MICROSIM card 58 in order to define a single position for inserting and for installing the card 58 in its lower compartment 154 when its rear transverse edge 77 butts against the internal vertical face 193.

Longitudinal retention of the MICROSIM card 58 in its compartment 154 is provided by two thickened regions 196 which extend vertically downwards and each of which defines a stop facet 198 intended to engage with the facing portion of the front transverse edge 76 of the MICROSIM card 58.

The external lateral faces 200 of the vertical walls 184 each have three horizontal tabs 202 which extend transversely outwards level with the lower plane 204 of the walls 184. These tabs 202 form the complementary means of the rails 104 and of the tabs 108 of the lower part 80 of the connector body 52 in order to ensure bayonet mounting of the card-holder slide-in unit 54 on the connector body 52.

Thus, the tabs 202 are capable of simultaneous vertical penetration into notches 206 (see Figure 19), and they can then slide in the corresponding rail 104 beneath the lower faces 109 of the tabs 108 in order to provide vertical retention

of the card-holder slide-in unit 54 with respect to the lower part 80 of the connector body 52.

In order to facilitate the longitudinal insertion during the bayonet-type movement, the front longitudinal ends of the vertical walls 184 have external chamfers 208.

In order to provide downward vertical retention of the MICROSIM card 58 in its compartment 154, the vertical walls 184 each have, on the lower face 204, a pair of retaining tabs 210 which extend vertically inwards and the upper faces 212 of which are designed to engage with the facing portions of the lower face 72 of the MICROSIM card 58 in order to provide its downward vertical retention.

The arrangement according to the first embodiment is such that, when the two cards 56 and 58 are each in place in their corresponding compartment 152, 154, their front transverse edges 66 and 76, which are the reference edges for the standardized positioning of their respective contact pads 64 and 74, are aligned longitudinally with respect to each other (see Figures 13, 14 and 6).

When the two cards 56 and 58 are in position in the card-holder slide-in unit 54, there is a clearance between the two cards which corresponds approximately to the thickness of the partition 150 and which makes it easier to grip the cards in order to remove them. If both cards are present, the elasticity of the MICROSIM card 58 is brought into play and, in order to remove the MMC card, the partition 150 is deformed slightly. If it is desired to remove the MMC card 56 first, a force is applied to the blocks consisting of the thickened regions 180 and 196 in order to deform the partition sufficiently and to retract the stops 182.

The vertical positioning of the card-holder slide-in unit 54 with respect to the connector body 52 is defined by the lower face 153 of the intermediate partition bearing against the facing portions of the upper face 88 of the plate-shaped lower part 80 of the connector body 52.

By virtue of this positioning, and of the vertical positioning of the MMC upper card 56 in the card-holder slide-in unit 54, the face 60 of the MMC card 56, at its front transverse edge 66, passes above the facet 136, as may be seen in Figure 10, whereas, if the MMC card 56 is positioned correctly in its compartment 152 its cut corner 68 engages with the polarizing wall 140, 142.

Should the MMC card 56 be mounted incorrectly, the cut corner 68 is not in the proper position and it is then one of the other three corners of the MMC card which butts against the vertical polarizing wall 140, 142 thus preventing complete insertion, into the data-access position, of the card-holder slide-in unit 54, this improper insertion or incomplete insertion able to be detected visually from outside the apparatus insofar as the profiled rear longitudinal end part 220 of the card-holder slide-in unit 54 then projects longitudinally rearwards with respect to the casing, for example, that surrounds the apparatus fitted with the connector 50.

Likewise, if the MICROSIM lower card 58 is in an improper position in its corresponding lower compartment 154, its front transverse edge 76 then projects longitudinally forwards beyond the card-holder slide-in unit and butts against a transverse stop bar 222 formed in relief on the horizontal face 98 - which is illustrated in the context of the second and third embodiments (see especially Figure 25) - thus again

preventing complete insertion of the card-holder slide-in unit 54 into the operating position in the connector 50.

As may be seen in Figure 6, the profiled rear longitudinal end part 122 is recessed, that is to say it has a concave inner and lower face 224 making it easier to grip the slide-in unit 54 in order to remove it from the connector 50 longitudinally from the front to the rear.

Likewise, the rounded cut-out 176 makes it easier to remove the MMC card 56 and the MICROSIM card 58 from their respective compartments 152 and 154, allowing them to be gripped by their front transverse edge 66, 76.

In Figure 23, it may firstly be seen that the length of the conducting pads 64 on the MMC card 56 is great enough to guarantee that, despite the longitudinal offset of the contact ends 146 and 146', these ends are in contact with a corresponding track when the MMC card with the slide-in unit 54 is in position in the connector 50.

The points of contact with the pads 64 are denoted by the references p146 and p146'.

Likewise, in Figure 23 the points of contact between the contact ends 100 of the contact blades 84 and the pads 74 are denoted by the reference p100.

Figure 24 shows the printed-circuit board P with its upper face having conducting pads intended to be connected by soldering to the output connection leads 102, 148 and 148', which are denoted by the references pc102, pc148 and pc148'.

Figure 24 also shows the centres c64 and c74 of the conducting pads on the MMC card 56 and on the MICROSIM card 58.

Referring to Figure 23, it may be observed that the two cards are not centred transversely with respect to each other

but that the MICROSIM card, with regard to this same Figure 23, is slightly offset to the left with respect to the MMC card.

The second embodiment illustrated in Figures 25 to 43 will now be described.

In this embodiment, if it is compared with the previous one, there is no longer an upper part of the connector 50, but its insulating body consists essentially of a lower part 80 made of two parts - a rear part 80' and a front part 80" - that are joined together by means which will be described later.

Another major difference consists in that both the contact ends 100 intended to allow connection to the MICROSIM card 58 and the contact ends 146, 146' intended to allow connection to the contact pads on the MMC card 56 are oriented vertically upwards. In a complementary manner, the two cards 56 and 58 carried by the card-holder slide-in unit 54 are positioned in the slide-in unit, as may be seen in Figures 25C and 36, with their respective faces 62 and 72 bearing the contact pads 64 an 74 oriented vertically downwards when the slide-in unit is in the operating position in the connector.

On the other hand, the bayonet-type means of mounting the slide-in unit 54 on the lower part 80 are preserved and are arranged thereon essentially in the rear lower part 80' of the body 52.

Referring especially to Figures 26, 27 and 32, it may be seen that, near its front end, the rear part 80' is extended by two parallel and opposed lateral arms 230 which between them define, on the inside, two guiding and positioning rails 232 for the block of insulating material forming the front part 80", each of the opposed lateral faces 234 of which includes a corresponding horizontal slideway 236.

A stop 238 formed in the rails 232 defines the rearward longitudinal position of the front block 80" and this is held in the assembled position by two chamfered lugs 240 formed on the internal faces of the rails 232, the latter bending elastically transversely outwards when fitting the front block.

In the assembled position of the two parts - the rear part 80' and the front part 80" - as may be seen for example in Figures 35 and 31, there is a space between the front transverse face 242 of the rear part 80' and the rear transverse face 241, 241' of the front block 80" so that the connection or output leads 102 associated with the contact elements that are borne by the rear part 80' and are arranged longitudinally to the front, can extend into this clear region in order to be connected to the corresponding tracks on the printed-circuit board P.

The seven connection leads 148, 148' of the contact blades for connecting the MMC card themselves project longitudinally forwards beyond the rear transverse face 122, 122' of the front block 80".

In order to ensure that the front part of the MMC card 56, which projects longitudinally forwards out of the slide-in unit 54 and whose face 62 bearing the contact pads 64 is well pressed vertically downwards in the direction of the ends 146 and 146', the opposed lateral arms 230 of the rear block 80' each have a vertical right-angled piece 244 whose horizontal branch or roof 246 forms, by its lower face 248, a bearing face for the upper face 60 of the MMC card 56, entry chamfers 250 making it easier for the card to pass under the branches 246.

Likewise, the vertical branches 252 of the right-angled pieces 244 each have an entry chamfer 254 so as to guide the opposed lateral edges 57 of the front part of the MMC card 56,

guiding it between the vertical and opposed internal faces 256 of the vertical branches 252.

The 45° inclined facet 142, designed to allow the position of the MMC card 56 to be polarized, by the latter engaging with the cut corner 68, is formed here inside the right-angled piece 244 on the right-hand side in Figure 26, and this facet is designed to engage with the upper portion of the cut corner 68, while the lower portion of the latter is designed, as will be explained below, to hold the MMC card 56 in the card-holder slide-in unit 54.

In the operating position, and as may be seen in Figure 37, the lower face 62 of the MMC card 56 is thus pressed against the upper face 114 of the front block 80" beyond which the contact ends 146 and 146' normally project.

Given the tolerances, there may be a slight clearance between the surfaces 114 and 62, the MMC card then being pressed elastically upwards by the ends 146 and 146', so as to bear against the lower horizontal faces 248 of the right-angled pieces 244 (see Figure 38).

The lower face 260 of the front block 80" is, of course, coplanar with the lower face 86 of the rear part 80".

Figure 41 shows the MICROSIM card 58 and the MMC card 56 as well as part of the intermediate partition 150 of the card-holder slide-in unit, and it may be seen in this figure that it is the MICROSIM card 58 which has its longitudinally offset transverse edge 77, which here is its rear edge, further to the rear than the transverse edge 67 of the MMC card 56.

The dimensions given in millimetres in Figures 40 and 41 allow the dimensions of the various elements and their relative positioning to be understood.

With regard to the card-holder slide-in unit 54, its design is generally similar to that described above with reference to the first embodiment.

Thus, all the means relating to positioning and holding the MICROSIM lower card 58 are identical, but it may simply be observed, for example by comparing Figure 25C with Figure 10, that the housing 154 for the MICROSIM card 58 is generally offset longitudinally rearwards with respect to the gripping part 220 of the slide-in unit so that the front transverse edge 76 of the MICROSIM card 58 is also offset longitudinally rearwards in order to be clear of the lower face 62 of the front part of the MMC card 56 which bears the contact pads 64, as may be seen in Figure 25C for example.

Comparing Figures 33 and 34 with Figures 11 and 13 for example, it may be seen that the design of the upper housing 152 of the card-holder slide-in unit 54 is generally similar in the first two embodiments, except for the means of longitudinal retention of the MMC card 56 in its housing, which means comprise here a single thickened region 180 which is formed along one of the lateral edges of the housing 152 and which has a stop facet 182 oriented generally transversely rearwards, this facet here being inclined at 45° in order to engage with the lower part, with regard to Figure 34, of the cut corner 68 and to form the means of polarizing the position of the MMC card in its housing (see Figure 34).

Figures 25, 25C and 25D show a stop device for the longitudinal position of the card-holder slide-in unit 54 with respect to the rear part 80'.

These means consist of an elastic blade 264 which is moulded as one piece with the part 80' and which has a protruding lug 266 which projects vertically upwards above the

upper face 88. The longitudinal orientation branch or blade 264 may bend in the manner of a beam in order to allow the lug 266 to retract.

The lug 266 is designed to be housed in a complementary notch in the form of a concave cylindrical arc 268 formed opposite it in the lateral part of the lower face 153 of the slide-in unit 54 which slides, while being pressed vertically, on the upper face 88 of the rear block 80'.

As may be seen especially in Figure 39, in order to allow the card-holder slide-in unit to be fully engaged while especially allowing engagement with the means 68 - 142 for polarizing the MMC card 56, the vertical branch 252 of the right-angled piece 244 on the right-hand side has a shoulder or chamfer 280 allowing the free end 282 of the card-holder slide-in unit 56 to pass, this free end 282 also having a complementary shoulder 284.

The shoulder 280 advantageously forms over its entire height a chamfer 254 making it easier for the MMC card to be guided laterally during insertion of the card-holder slide-in unit 54.

As may be seen in Figure 52, the MICROSIM card 58 here is perfectly centred transversely with respect to the MMC card 56.

With regard to the third embodiment shown in Figures 44 to 55, comparison should be made with the second embodiment just described with reference to Figures 25 to 43.

In fact, it should firstly be noted that the design of the card-holder slide-in unit illustrated for example in Figure 25C may be used in the third embodiment, as long as some dimensional modifications are made.

With regard to the body 52 of the connector, this again consists here only of a lower part 80 made of two pieces, i.e. a generally rear part 80' and a generally front part 80".

The means of joining the front part 80" to the rear part 80' also consist here of opposed lateral arms 230 which extend the rear part 80' longitudinally forwards and the facing internal faces of which have vertical slideways 236 emerging vertically upwards and downwards which house, so as to slide vertically, complementary rails 232 formed so as to project transversely outwards on the lateral faces 234 of the front block 80".

There are strictly speaking no means of vertical immobilization of the front block 80" with respect to the rear block 80', it being possible for these means, which are not shown, to be provided but they are not obligatory insofar as, during the operation of soldering the subassembly consisting of the two pre-assembled parts 80' and 80", this relative immobilization results from the soldering of the various connection faces to the corresponding printed-circuit board.

In order to press the front part of the MMC card 56 vertically so as to bear against the contact ends 146 and 146', the design of the two right-angled pieces 244 is simplified, these having a common upper roof 246 which extends over the entire transverse width of the connector and the lower face 248 of which bears against the facing face 60 of the MMC card.

The latter is polarized by a lug 243 which is borne by the right-angled piece 244 on the right-hand side and defines the internal polarizing facet 142.

In addition to the means of joining the rear part 80' to the front part 80", the latter is distinguished essentially from that described with reference to the second embodiment in that the electrical-contact elements for connecting the MMC card

are oriented longitudinally in the opposite direction, that is to say their output or connection leads 148 and 148' are oriented longitudinally towards the rear of the connector, that is to say they extend so as to face the front transverse face 242 of the rear part 80'.

Thus, as may be seen in Figure 47 by comparing it with Figure 31, the output leads 102 and 248, 248' are adjacent and/or imbricated, and no output lead projects beyond the front end transverse face of the front block 80".

As may be seen in Figure 49, the front transverse edge 66 of the MMC card 56 may come into longitudinal abutment against the facing transverse face 290 formed in a vertical partition 292 which connects the right-angled pieces 244 together.

This abutment thus constitutes, in this embodiment, the longitudinal stop for insertion of the slide-in unit 54.

The general design of the card-holder slide-in unit 54 for the third embodiment is identical to that described with reference to the second embodiment, except, of course, for the relative positioning of the two housings 152 and 154 and therefore for the positioning of the corresponding cards.

This difference in positioning is especially apparent in Figures 53 to 55.

A description will now be given of the alternative form of the means of holding the card-holder slide-in unit in position on the support 52, these means being illustrated in Figures 56 to 57B, the rest of the design of the slide-in unit and of the connector illustrated in these figures being generally identical to that of the third embodiment just described.

As may be seen in Figure 56, the slide-in unit 54 here has two opposed lateral cheeks 300 which extend vertically

downwards, beyond the lower face 153, at the front longitudinal end of the slide-in unit and each of which has a snap-fastening finger 302 which extends transversely inwards.

The cheeks 300 are designed to slide, by their opposed internal face 304, along the opposed external lateral edges 94 of the rear part 80' of the lower part 80 of the connector body.

This lower part 80 has two lateral housings 306 in its lower face 86 in order to allow the two fingers 302 to pass, and the lower faces 308 of these housings have, near the front longitudinal ends of the arms 230, two lugs 266 of convex semicylindrical profile which extend vertically downwards.

As may be seen in Figure 57A, during longitudinal insertion of the lid 54 from the rear to the front, the entire front part of the latter bends vertically downwards because of the engagement of the fingers 302 with the lugs 266, the very rigid MMC card 56 itself not being elastically deformed.

In the snap-fastened position illustrated in Figure 57B, the fingers 302 are located longitudinally at the front with respect to the lugs 266 and the front part of the card-holder slide-in unit 54 is no longer elastically deformed downwards.

Moreover, the process of the lugs 266 getting past the fingers 302 provides a tactile sensation of the arrival in the operating position of the slide-in unit 54.

Given the fact that the longitudinal retention means of the slide-in unit 54 with respect to the lower part 80 of the support for the connector are designed to bear beneath this lower part, it is no longer necessary to provide means for pressing the MMC card 56 vertically downwards in its front part and thus, as may be seen in Figure 57, only a single "right-angled piece" 244 is provided on the longitudinal arm on the right-hand side, the function of this piece being simply to bear

the polarizing facet 142 intended to engage with the cut corner 68 of the MMC card.

The alternative form, illustrated in Figures 58 to 60, called the "low-profile" form, that is to say a form which has a very small overall height, will now be described.

For this purpose, as may firstly be seen in Figure 58, the upper part of the card-holder slide-in unit 54, that is to say that part which includes the upper housing that houses the MMC card 56, is simplified insofar as there are no means for the upward vertical retention of the card 56, the free face 60 of which, here the upper face, is flush with the plane of the upper face 164 of the card-holder slide-in unit 54.

The cut corner 68 is completely clear and the MMC card 56 is retained longitudinally by a transverse stop facet 182 on a thickened region 180 made along the lateral edges of the card-holder slide-in unit.

That lower part of the card-holder slide-in unit 54 which is not illustrated in detail in the figures is generally identical to that described with reference to the third embodiment, the arrangement of the two cards - the MMC card 56 and the MICROSIM card 58 - also being identical, with the contact pads 64 and 74 longitudinally offset with respect to one another and oriented vertically downwards.

As may be seen in Figure 59, the single lower part 80 of the connector support made of two parts - the rear part 80' and the front part 80" - is also simplified insofar as there are no means integrated into the connector for pressing the MMC card vertically downwards.

As may be seen in Figure 60, in which the connector 50 is illustrated mounted in a piece of equipment which houses it, the MMC card 58 is held vertically upwards by the facing lower

face 320 of an upper plate or wall 322 forming part of the piece of equipment, the latter also having a rear vertical wall element 324 and a printed-circuit board P to the upper face 326 of which the connector 50 is fixed.

Thus, the total height of the connector 50 is reduced and corresponds approximately to the height available between the lower face 320 of the upper wall 322 of the piece of equipment and the upper face 326 of the printed-circuit board P.

The body of the connector illustrated from Figure 61 onwards corresponds to the second embodiment illustrated from Figure 25 onwards and has a switch consisting of a blade for detecting the presence of the MICROSIM lower card and a switch consisting of a blade for detecting the presence of the slide-in unit with an MMC card in position.

The switch 380 illustrated in the figures consists essentially of a switch blade 382 made of conducting material which is mounted in a housing 355 formed in the upper face 98 of the connector body and is fixed by a central stud 388, the head of which is hot-crimped.

The switch blade 382 has two branches B1 and B2 each of which engages with a contact end 100 belonging here to a standard pair of aligned contacts for connecting a MICROSIM card.

In this first exemplary embodiment, illustrated in Figures 61 to 64, the switch 380 is of the normally-open type, that is to say, as may be seen in Figure 63, and in the absence of the MICROSIM card, the curved branches B1 and B2 are not in contact with the corresponding contact ends 100 but extend above them with a vertical clearance and they project vertically

upwards above the plane upper face 98 of the insulating body 80'.

When the MICROSIM card 56 is inserted longitudinally, from the left to the right in Figures 53 and 54, it causes the two contact branches B2 and B1 to bend in succession, these contact branches coming into contact with the contact ends 100 and also causing the latter to bend vertically downwards so as to form two contact points P2 and P1, a switching circuit then being established between the output or connection ends 102 of the two contact blades 100 used for producing the switch 380. When removing the slide-in unit 54, which is carrying especially the MICROSIM card 58, it is firstly the first contact point P1 which is eliminated and then the second contact point P2, the switching circuit then being open again.

In the alternative form illustrated in Figures 65 to 68, the switch 350 for detecting the presence of the MICROSIM card 58 is of the normally-closed type that is to say, in the absence of a card and as may be seen in Figure 67, the two branches B1 and B2 of the switching blade 382 are in contact with the aligned contact ends 100 and define two contact points P1 and P2 which close the switching circuit between the output or connection leads 102 of the two aligned electrical contacts.

When the MICROSIM card 58 is present, as illustrated in Figure 68, the two contact ends 100 are bent elastically downwards, like the signal contacts used for connection to contact pads on the MICROSIM card, and the two contact points P2 and P1 are eliminated, that is to say the switching circuit is open, thus indicating that the MICROSIM card 58 is present.

The blade-type switch used for detecting the presence of the slide-in unit 54 with an MMC card 56 will now be described.

For this purpose, and as may be seen in Figures 61 and 65, the lateral part on the right-hand side, in these figures, of the rear part 80' of the insulating support has two additional contact blades which are similar to the signal contact blades and therefore each projects vertically above the upper face 468 of this lateral part in order to form a free contact end 400.

Each contact blade of the switch has, of course, a connection or output lead 402 designed to be connected to a conducting track (not shown) on the printed-circuit board carried by the connector.

The switch for detecting the presence of the card-holder slide-in unit shown in the figures is of the normally-open type and it is closed, in the presence of the card-holder slide-in unit 54 illustrated in Figure 9, by a switch blade 482 carried by the slide-in unit and which projects vertically downwards in the corresponding lateral part of the lower face 153 of the slide-in unit, which bears normally on the insulating support.

As may be seen in Figures 69 to 71, this switch blade 482 has two catching branches 484 which pass into corresponding holes 486 where they are caught by their free longitudinal ends 488 in notches 490 in the card-holder slide-in unit 54.

The central branch B of the switch blade 482 extends opposite the two contact ends 400 and, in the absence of the MMC card 56 in the slide-in unit, the vertical position of the central branch B is such that it is not in contact with its contact ends 400.

As illustrated in Figure 71, when the MMC card 56 is present it acts via its lower face 62 on the catching branches 484 which have the shape of an upside-down V, the top of which projects into the path followed by the card 56 as it is being inserted into the card-holder slide-in unit 54.

As may be seen in Figure 71, when the card 56 is present the central branch B of the switch blade 482 is therefore moved vertically downwards and, when the slide-in unit 54 is in the operating position in the connector, the branch B engages simultaneously with its two contact ends 400 closing the switching circuit, i.e. electrically connecting together the output leads 402 of the switching system.

The switch consisting of the contact ends 400 and of the switch blade 482 therefore forms a switch for detecting the presence of the card-holder slide-in unit 54 and at the same time the presence in the latter of the MMC card 56.

In the fourth embodiment of a connector according to the teachings of the invention, illustrated in Figures 72 and 73, the card-holder charger 54 is mounted so as to be able to pivot, by pivoting with respect to the lower part 80 of the insulating support of the connector about a horizontal pivot axis A.

The general design of the card-holder charger 54 and of the lower part 80 is generally similar to that of the embodiment illustrated in Figures 25C and 59, respectively.

It can pivot about the axis A by virtue of two lateral and opposed hinge elements 500 formed near the rear end transverse face 97, the internal face 502 of each element 500 having a hole 504 which houses a complementary lug 506 forming a hinge pin which extends transversely towards the outside from an external lateral face 508 of a pivoting portion

510 of the card-holder charger 54, this portion 510 being made near the rear longitudinal end of the latter.

The pivoting part 510 is mounted between the lateral faces 502 of the hinge elements 500 by elastically deforming the latter transversely outwards.

The pivoting lid forming the card-holder charger 54 may thus pivot vertically downwards as far as a closed position in which the contact pads 64 and 74 on the MMC card 56 and on the MICROSIM card 58 bear elastically between the contact ends 146, 146' and 100 of the connector body.

In order to keep the card-holder lid 54 in the closed position, two vertical tabs 512 are provided near the front longitudinal end of the card-holder lid, these tabs being elastically deformable in an outward transverse direction and each of them having a hook-forming catch 514 which extends in relief transversely inwards and is designed to be housed in a complementary notch 516 formed opposite it in the front part 80'' of the insulating support.

If the MMC card is not in a satisfactory position, closure is impossible since the cut corner 68 is then not opposite the inclined facet 142.

Likewise, if the card 58 is not in a correct position it projects longitudinally forwards beyond the normal position illustrated in Figure 72 and its transverse edge then lying longitudinally towards the front butts against the upper face 114 of the front part 80", thus preventing the connector from being fully closed.

Blade-type switches, or any other type of switch of known design in the form of added components, may also be used in the case of the pivoting card-holder lid 54 in order to

detect the presence of the cards 56 and 58 and/or the closure of the pivoting lid 54 in the operating position.

The final embodiment illustrated in Figures 74 and 76 will now be described.

As in the case of the embodiment illustrated in Figures 72 and 73, this is a card-holder lid 54 mounted so as to pivot on the lower part 80.

This embodiment is distinguished from all the previous embodiments firstly in that the MICROSIM card is placed transversely and not longitudinally, that is to say its main axis, along its length direction, is perpendicular to the axis of the MMC card which remains oriented longitudinally from the rear to the front.

There is no longer strictly speaking an intermediate partition between the two cards, and it is the MICROSIM card 58 which, when it is in place in its housing, provides the downward vertical retention of the MMC card 56.

The MICROSIM card is polarized by its cut corner 68 engaging with complementary means, not shown in detail, provided in the rear transverse bottom of the housing for the MICROSIM card.

The MICROSIM card is guided in partial grooves in the card-holder slide-in unit 54, these grooves being bounded downwards by tabs 210 and upwards by surface portions 150' which act in an equivalent way to that of the intermediate partition 150 provided in the previous embodiments.

If we consider the insulating support with its lower part 80, the contact elements 84 are, of course, arranged transversely with their output or connection leads 102 accessible along the lateral edges of this lower part.

This sixth embodiment is not limited to the illustration in Figures 73 to 76.

It is, for example, possible to produce the lower part 80 as a single piece by moulding, adopting a design for the front connection block similar to that illustrated in Figure 25, in which the outputs 148 and 148' are oriented longitudinally forwards.

If the MMC card is mounted in an incorrect position, the pivoting card-holder lid 54 cannot be closed since the cut corner 68 is not opposite the internal inclined facet 142.

Likewise, if the MICROSIM card 58 is not in a correct position, its edge 59 located longitudinally towards the front of the connector is offset in this front direction with respect to the position illustrated in Figure 74 and then butts against the connection region 520 between the upper face 98 of the connector part for connecting the MICROSIM card and the offset upper face 99 of the U-shaped part on the front block 80".

This final embodiment is advantageous in that it allows the total height of the connector to be reduced by eliminating the thickness of the intermediate partition 150.

This design allows the connector to be used only with the MICROSIM card which is normally used systematically in most applications. This is because, as explained above, even in the absence of the MMC card 56 the MICROSIM card 58 is perfectly held vertically in its housing 150' - 210.

The upward vertical bearing region of the MICROSIM card 58 is completed, near its edge 59 located longitudinally to the rear, by bearing vertically against a facing surface formed in the card-holder lid 54.

It will be noted that, in the absence of a MICROSIM card 58, there is no downward vertical retention of the MMC card 56 in the card-holder slide-in unit, that is to say it is held therein with a large vertical clearance which allows the user to detect this incorrect mounting.

When the card-holder charger 54 is not of the pivoting type but is of the sliding type, and if the free contact ends 100 are shaped in the form of an upside-down spoon, it is also possible to use an arrangement of the type illustrated in Figures 73 and 74 while still providing guiding means for a card-holder 54, in which two cards 56 and 58 are arranged in the geometrical arrangement illustrated in Figure 74, to slide longitudinally.

CLAIMS

1. Electrical connector (50) for the connection of at least two cards (56, 58) which include a contact-type flash card (56) of rectangular general shape, of the type having a connector body (80, 82) and a card-holder charger (54) which includes an upper compartment (152) for receiving the upper card (56) and which is mounted so as to be able to move, especially by longitudinal sliding, with respect to the connector body between an out position, in which each card may be put into its compartment or extracted from the latter, and an operating position, in which the contact pads (64, 74) on each card (56, 58) engage with associated electrical-contact elements (84, 144) on the connector body, characterized in that the card-holder charger (54) includes a lower compartment (154) for receiving a contact-type smart card (58) of rectangular general shape, in that, in the operating position of the card-holder charger (54), the contact pads (74) on the lower card (58) engage with associated electrical-contact elements (144, 146, 146') on the connector body and in that means are provided, on the one hand, for positioning each card (56, 58) with respect to the card-holder charger (54) and, on the other hand, for placing the card-holder charger (54) in the operating position with respect to the connector body.

2. Connector according to Claim 1, characterized in that the two compartments - the upper compartment (152) and the lower compartment (154) - are separated vertically by a horizontal intermediate partition (150) the upper face (151) and lower face (153) of which form the respective lower and upper bottoms of the upper and lower compartments.

3. Connector according to the preceding claim, characterized in that each compartment (152, 154) is bounded

longitudinally rearwards by a rear transverse edge (156, 193) of the compartment and in that each of the cards (56, 58) is retained longitudinally without any clearance in its compartment by at least one retaining spur (180, 182, 196, 198) on a front end transverse edge (174, 176) of the intermediate partition (150).

4. Connector according to any one of the preceding claims, characterized in that each card (56, 58) is retained vertically in its compartment (152, 154) into which it has been put by inserting it longitudinally from the front to the rear.

5. Connector according to any one of the preceding claims, characterized in that the card-holder charger (54) can be detached from the connector body.

6. Connector according to the preceding claim, characterized in that the card-holder charger (54) is mounted in the operating position on a lower part (80, 80', 80") of the connector body by bayonet-type mounting means (202, 108, 206, 104) with a longitudinal locking movement of the card-holder charger (54) from the rear to the front at the end of mounting.

7. Connector according to any one of the preceding claims, characterized in that the upper card (56) is a card of the MMC type while the lower card (58) is a MICROSIM card with its lower face (72) bearing the electrical-contact pads (74).

8. Connector according to the preceding claim, characterized in that the face (62) of the MMC upper card (56) which is oriented vertically upwards bears the electrical-contact pads (74) which are aligned along the front end transverse edge (66) of this card.

9. Connector according to the preceding claim, characterized in that the upper compartment (152) or the lower

compartment (154), respectively, is at least partially open facing the contact pads (64, 74) on the card (56, 58) that it receives.

10. Connector according to Claim 7, characterized in that the face (62) of the MMC upper card (56) which is oriented vertically downwards bears the electrical-contact pads (74) which are aligned along the front end transverse edge (66) of this card (56).

11. Connector according to the preceding claim, characterized in that the upper compartment (152) and the lower compartment (154) are at least partially open vertically downwards, each facing the contact pads (64, 74) on the card (56, 58) that it receives.

12. Connector according to any one of Claims 7 to 11, characterized in that the cut-corner polarizing means (68) on the MMC card (56) engage with complementary means (142) on the connector body in order to prevent the card-holder charger (54) from occupying its operating position if the MMC upper card (56) is not put into its compartment (152) correctly.

13. Connector according to any one of Claims 7 to 12, characterized in that the cut-corner polarizing means (78) on the MICROSIM lower card (58) engage with complementary means (194) formed in its compartment (154) in order to prevent complete longitudinal insertion of the card into its compartment (154), the MICROSIM card (58) then preventing the card-holder charger (54) from occupying its operating position.

14. Electrical connector according to any one of Claims 7 to 13, taken in combination with either of Claims 5 and 6, characterized in that the connector body includes a lower part (80, 80', 80") in a general form of a plate made of insulating

material which bears the electrical-contact elements (84, 100) for connection to the contact pads (74) on the lower card (58).

15. Connector according to the preceding claim, taken in combination with Claim 6, characterized in that the bayonet means (202, 108, 206, 104) come into play between the card-holder charger (54) and a rear part of the lower part (80) of the connector body.

16. Connector according to the preceding claim, taken in combination with either of Claims 8 and 9, characterized in that the connector body includes an upper part (82) in the form of a plate (112) made of insulating material which bears the electrical-contact elements (144, 146) for connection to the contact pads (64) on the MMC upper card (56).

17. Connector according to the preceding claim, characterized in that the connector body includes a vertical and transverse rear end wall (122) which extends between the upper part (82) and the lower part (80) and which connects them (80, 82) together.

18. Connector according to Claim 16 or 17, characterized in that the connector body is made of two pieces moulded independently and then joined together, the first piece of which includes the lower part (80) and the second piece of which includes the upper part (82) and the vertical linking wall.

19. Connector according to any one of Claims 16 to 18, characterized in that the electrical-contact elements (144, 146, 146') for connecting the contact pads (74) on the MMC upper card (56) are electrical-contact blades whose rear free contact ends (146, 146') project vertically downwards and whose front free ends (148, 148') for connection to the printed-circuit board (P) which bears the connector body extend approximately vertically in line with the front free ends (102)

for connecting the electrical-contact blades (84) belonging to a front series of blades for connection to the contact pads (74) on the MICROSIM lower card (58).

20. Connector according to Claim 15, taken in combination with either of Claims 10 and 11, characterized in that the lower part (80) of the connector body includes a rear part (80') and a front part (80") which are joined together, in that the rear part (80") bears the electrical-contact elements (84, 100) for connection to the contact pads (74) on the lower card (58) and in that the front part (80") bears the electrical-contact elements (144, 146, 146', 148, 148") for connecting the connector to the contact pads (64) on the MMC upper card (56) that is oriented vertically downwards.

21. Connector according to the preceding claim, characterized in that the connection ends (148, 148') of the electrical-contact elements (146, 146') for connecting the conducting pads (74) on the upper card (58) are arranged longitudinally towards the front.

22. Connector according to the preceding claim, characterized in that the connection ends (148, 148') of the electrical-contact elements (146, 146') for connecting the conducting pads (74) on the upper card (58) are arranged longitudinally towards the rear.

23. Connector according to any one of the preceding claim, characterized in that the electrical-contact elements (144, 146, 146') for connecting the contact pads (74) on the MMC upper card (56) include free contact ends (146, 146'), at least one (146') of which is longitudinally offset towards the rear.

(43)

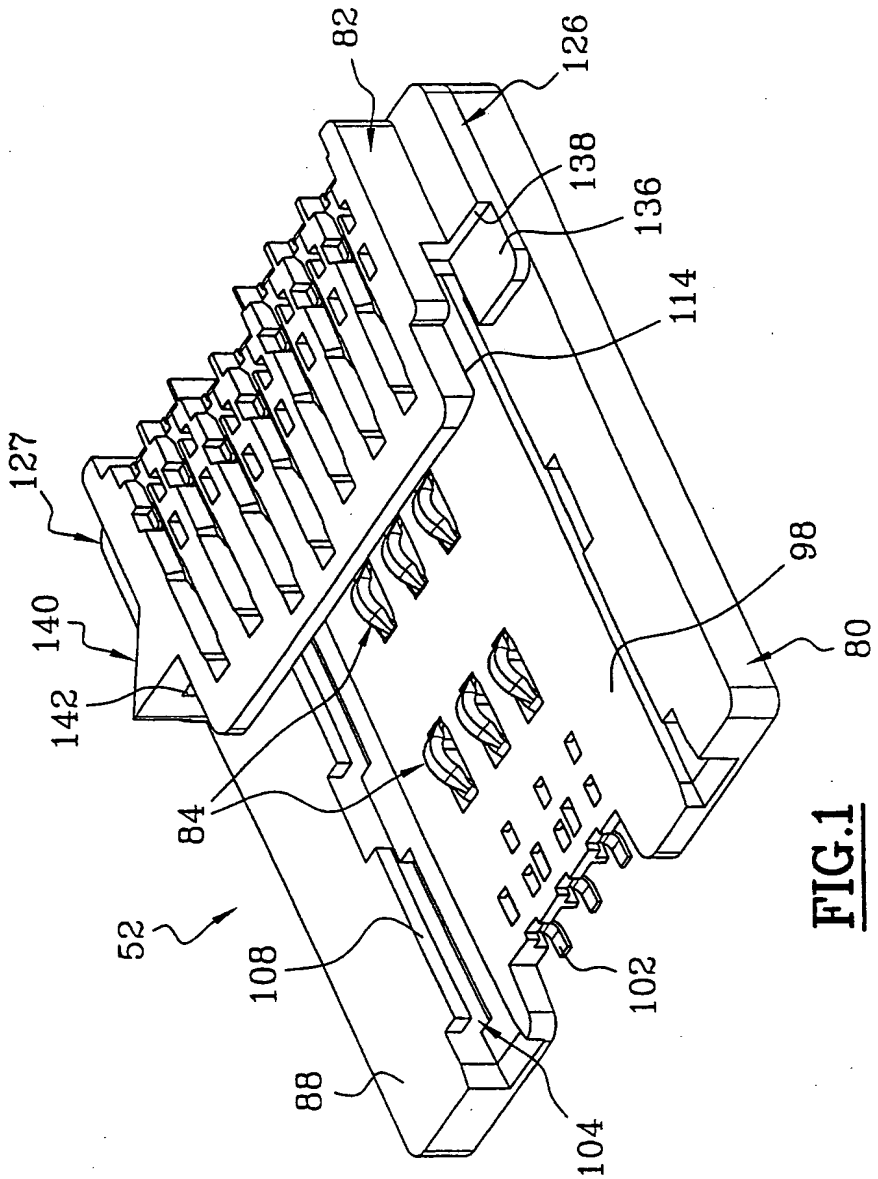
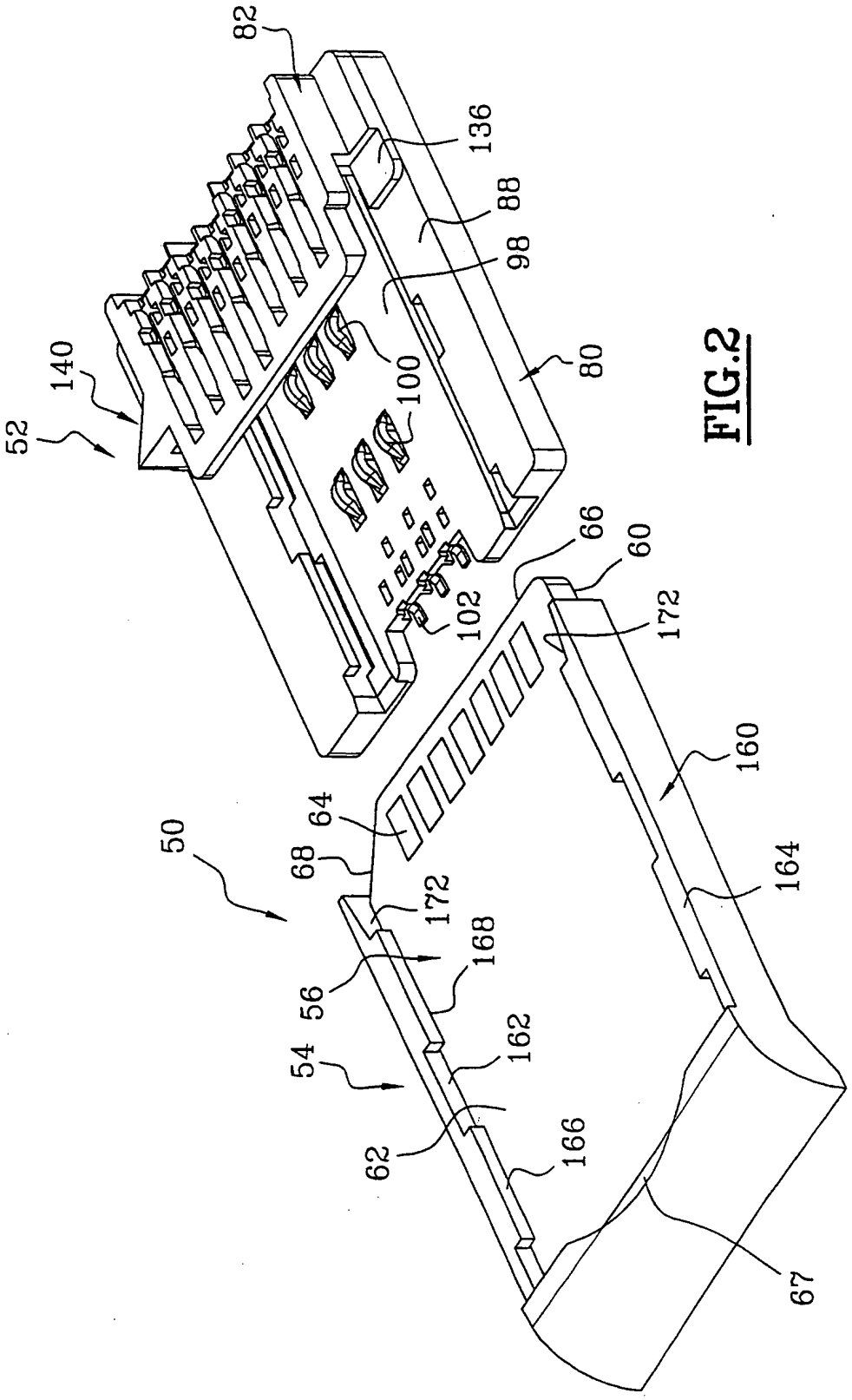


FIG.1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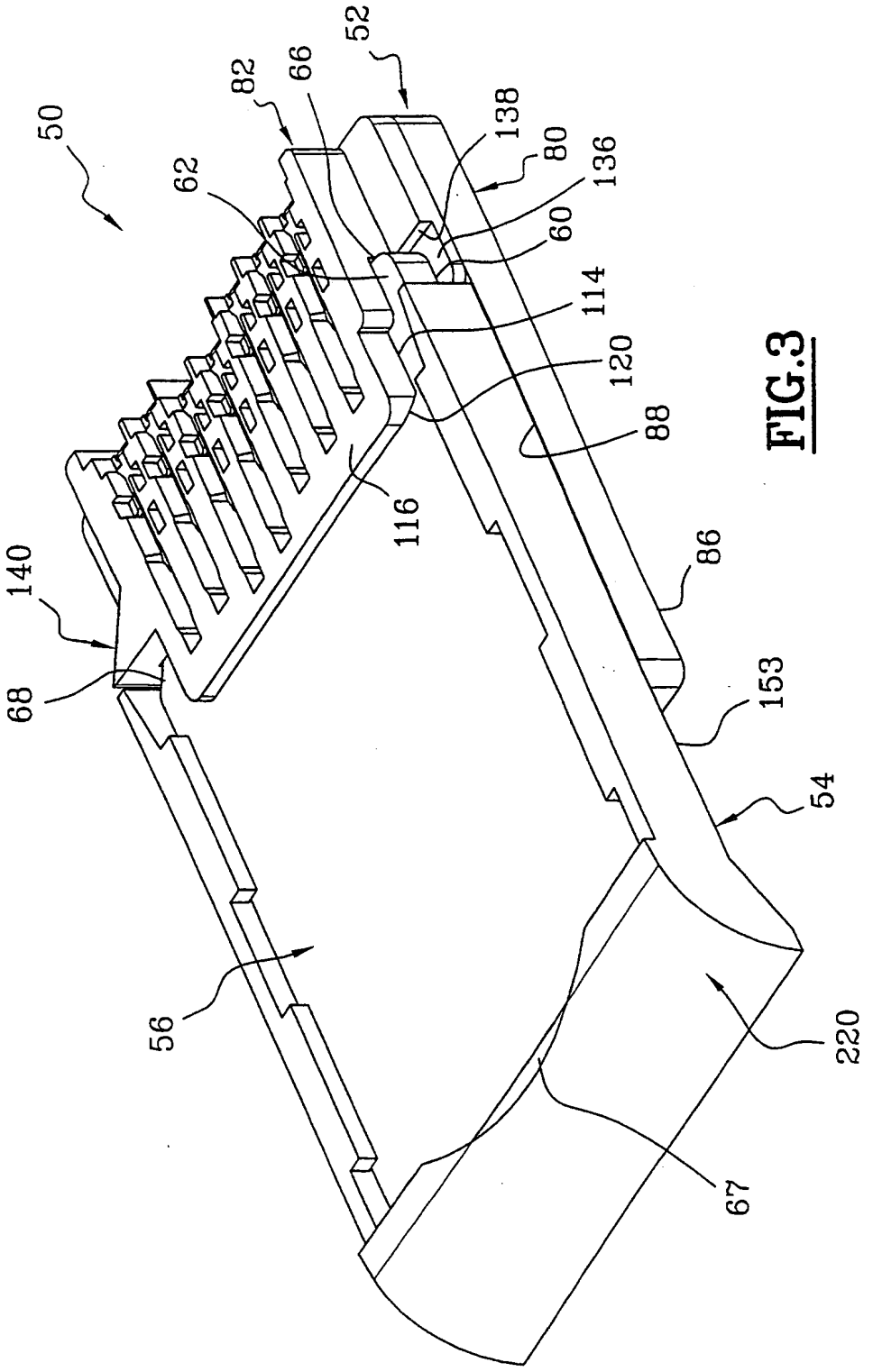
67

FIG.2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114
120
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116
86
140
68
153
54
56
220
67

FIG.3

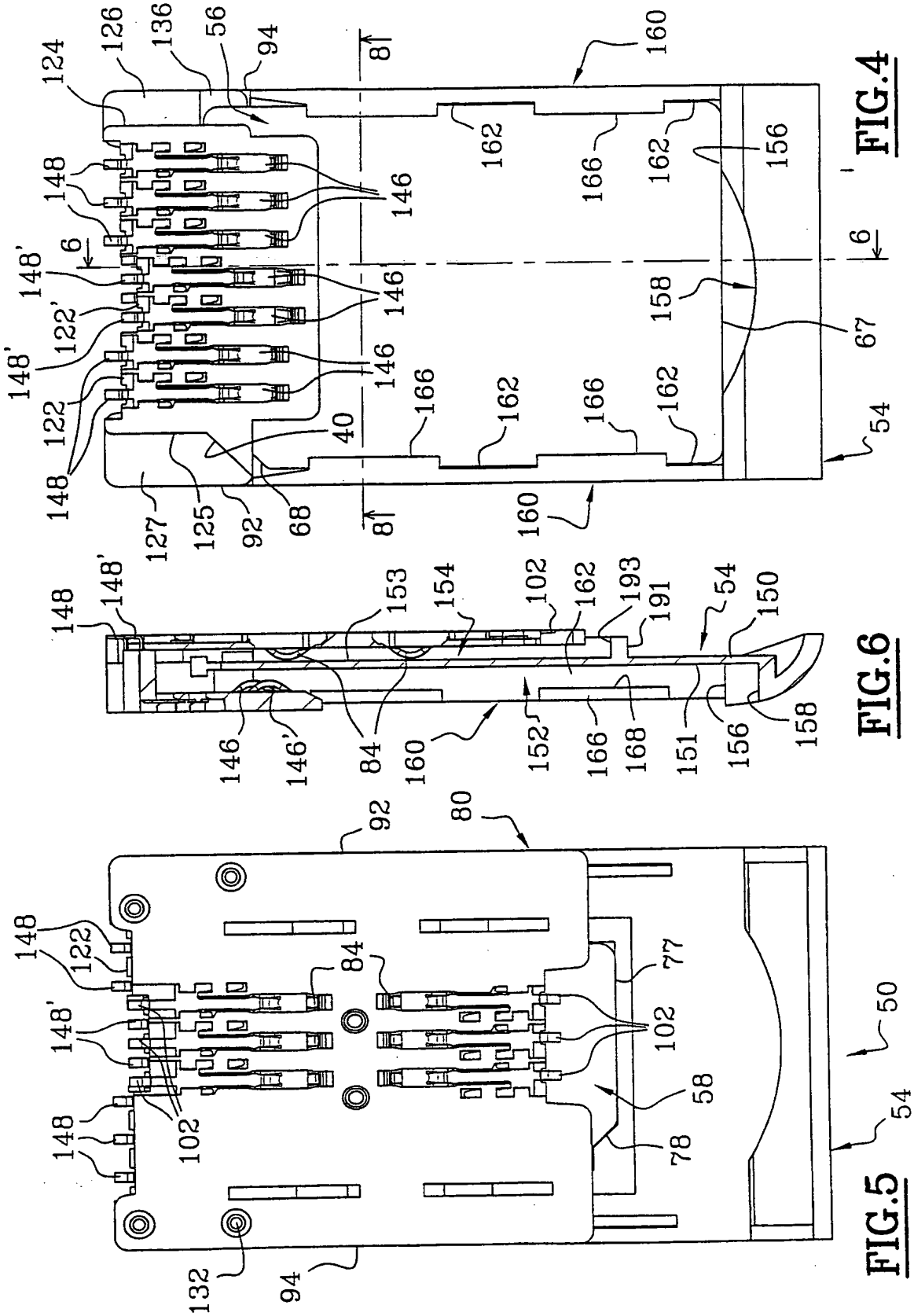
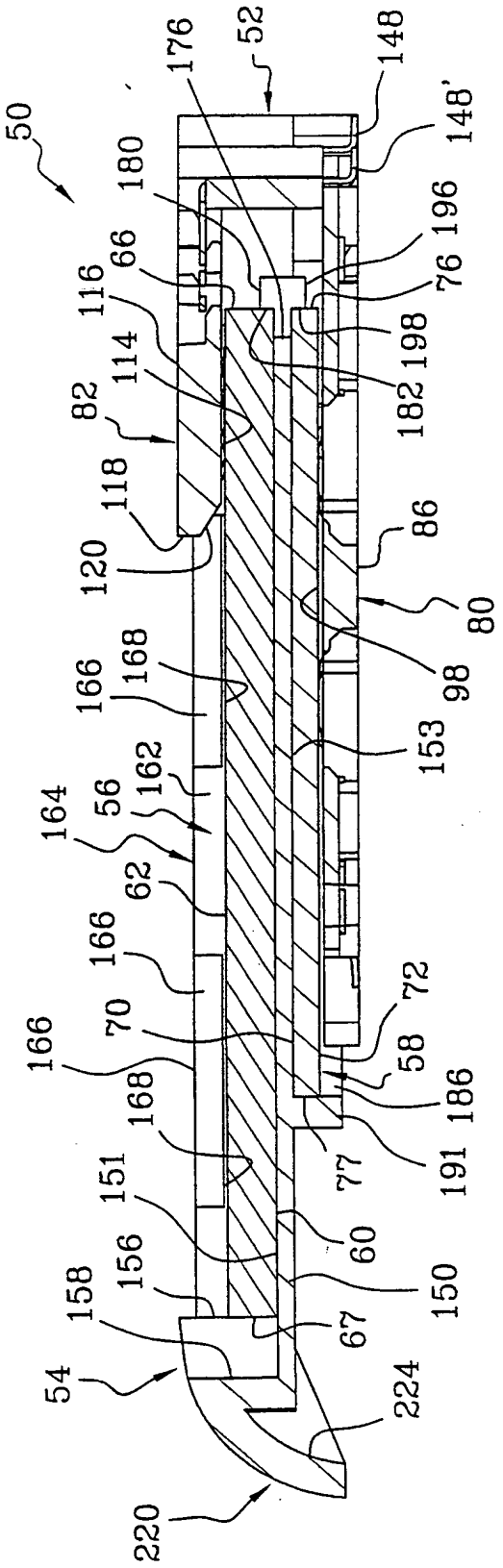


FIG.4

FIG.6

FIG.5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72
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77
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82
86
98
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120
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148'
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168
176
180
182
186
191
196
198
220
224

FIG.7

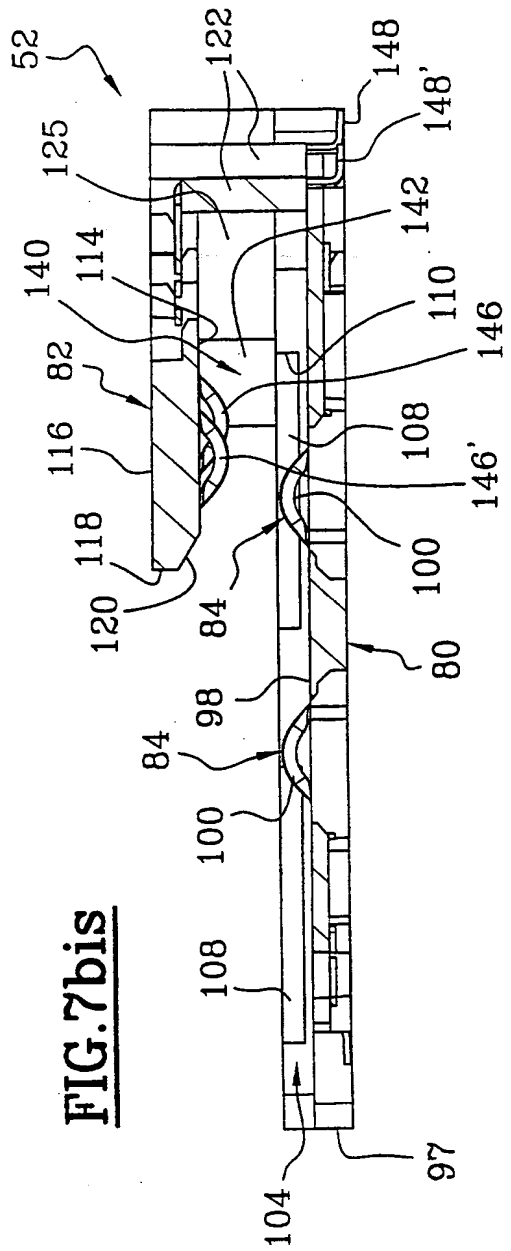


FIG.7bis

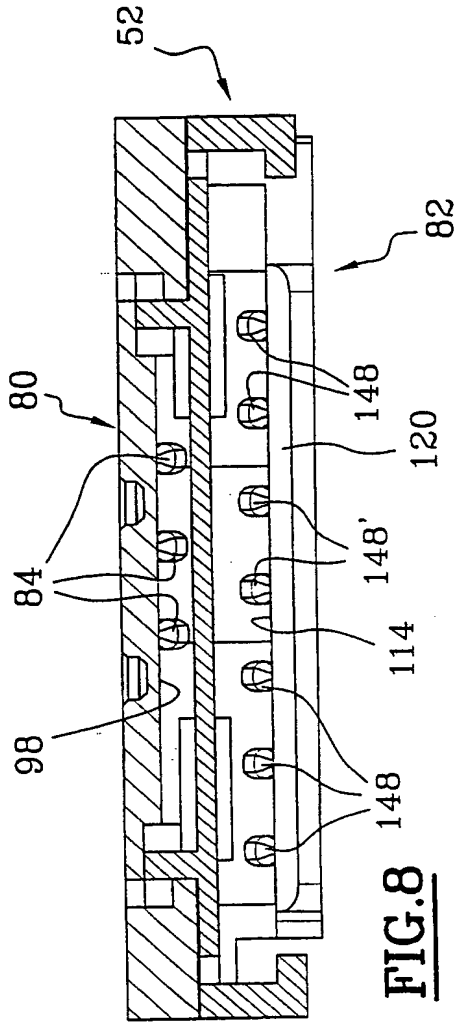
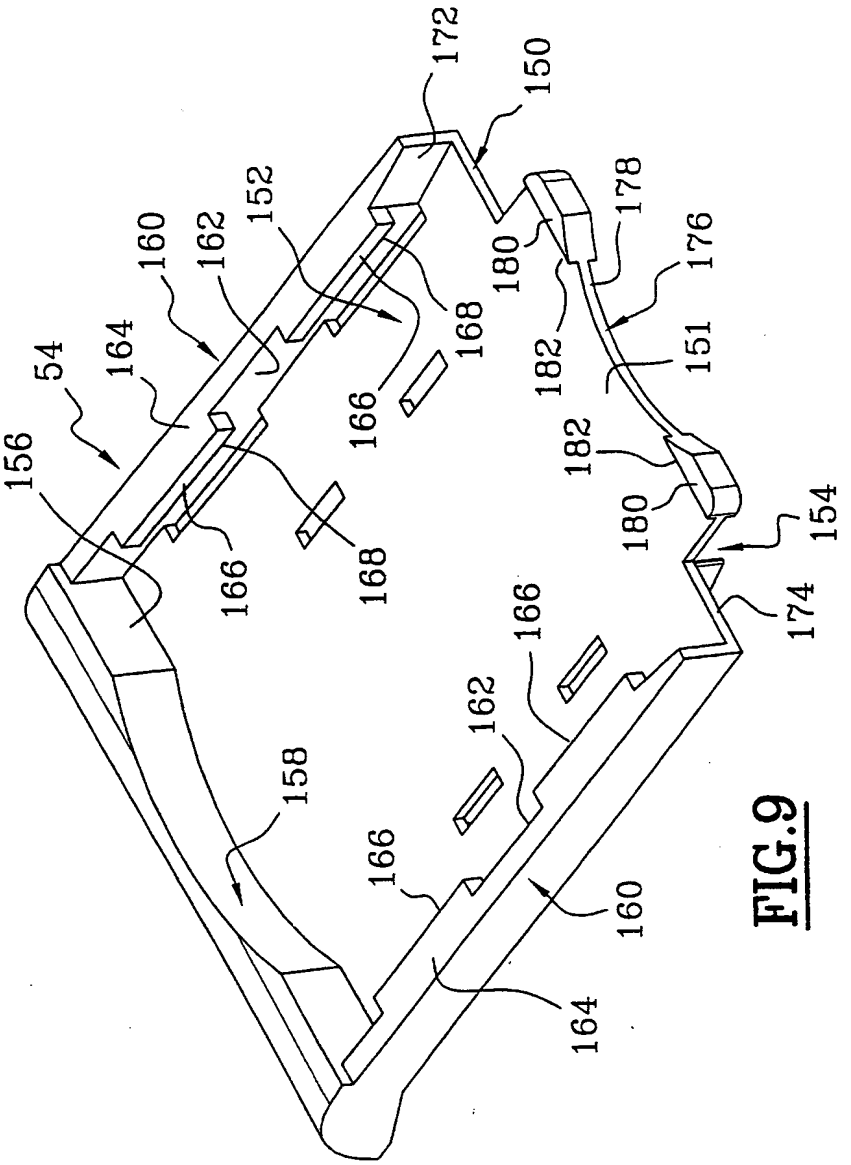


FIG.8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150
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176
152
160
162
180
151
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54
168
182
166
156
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180
154
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168
174
166
162
158
166
160
164

FIG.9

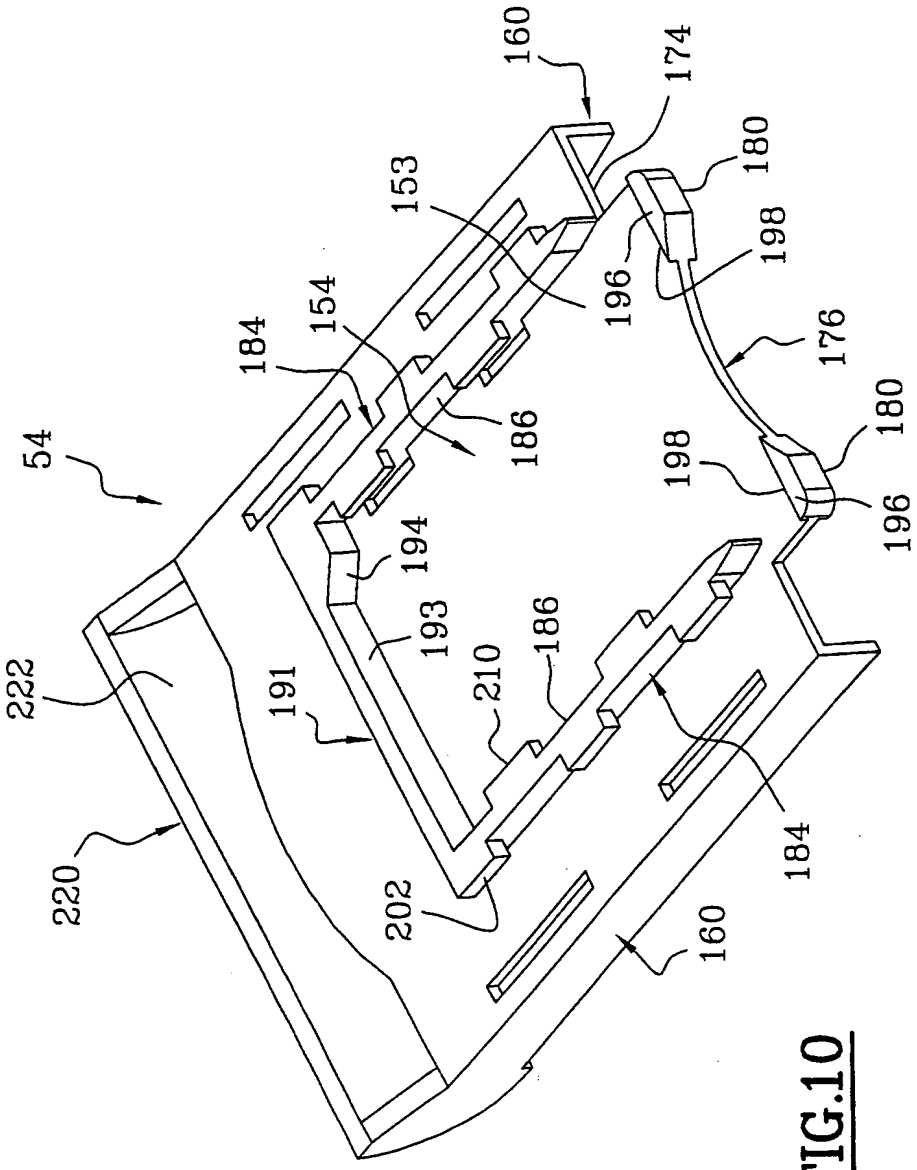
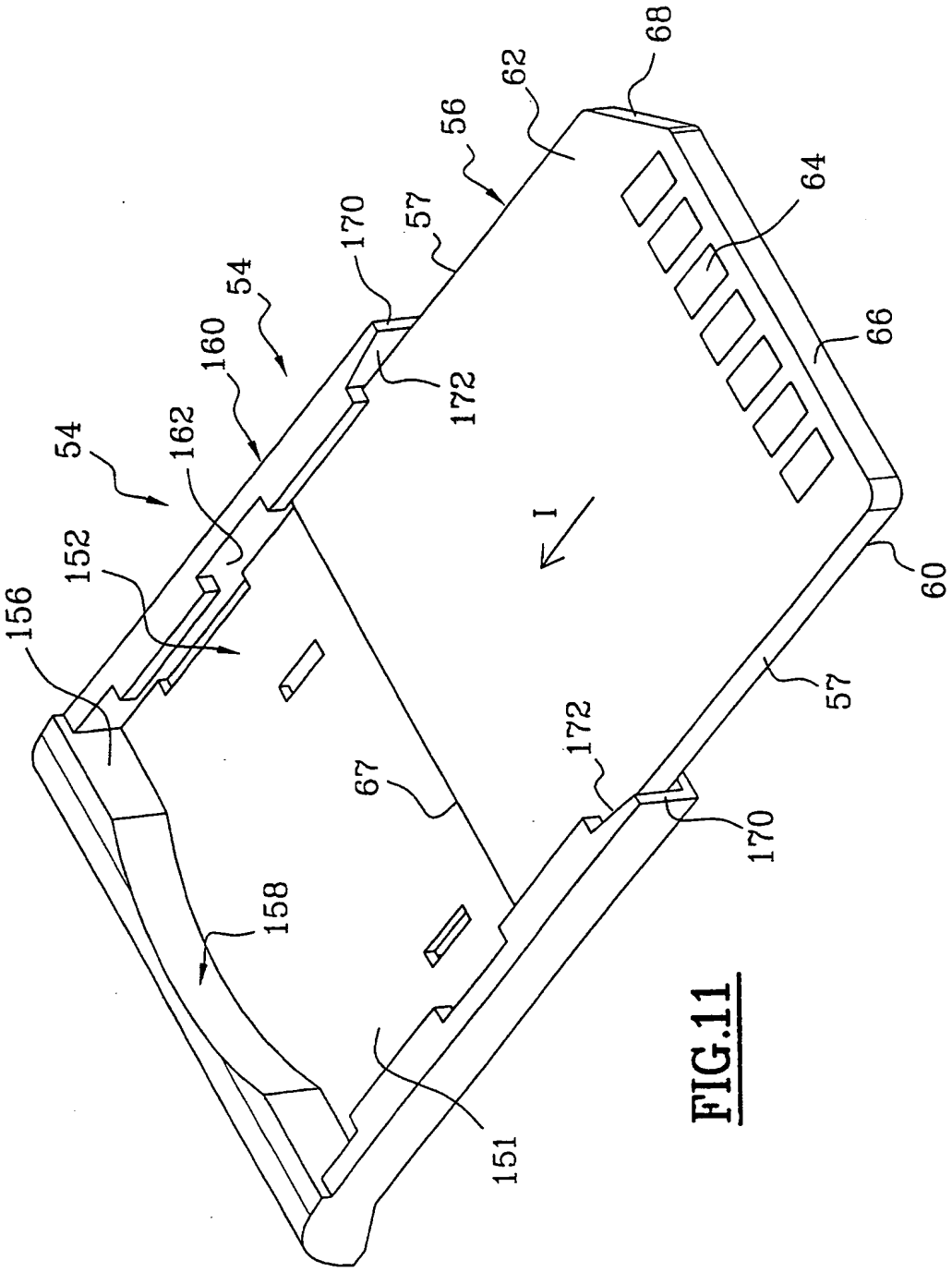

160
174
180
153
198
196
176
184
154
186
54
180
198
196
194
193
186
222
191
210
184
220
202
160

FIG.10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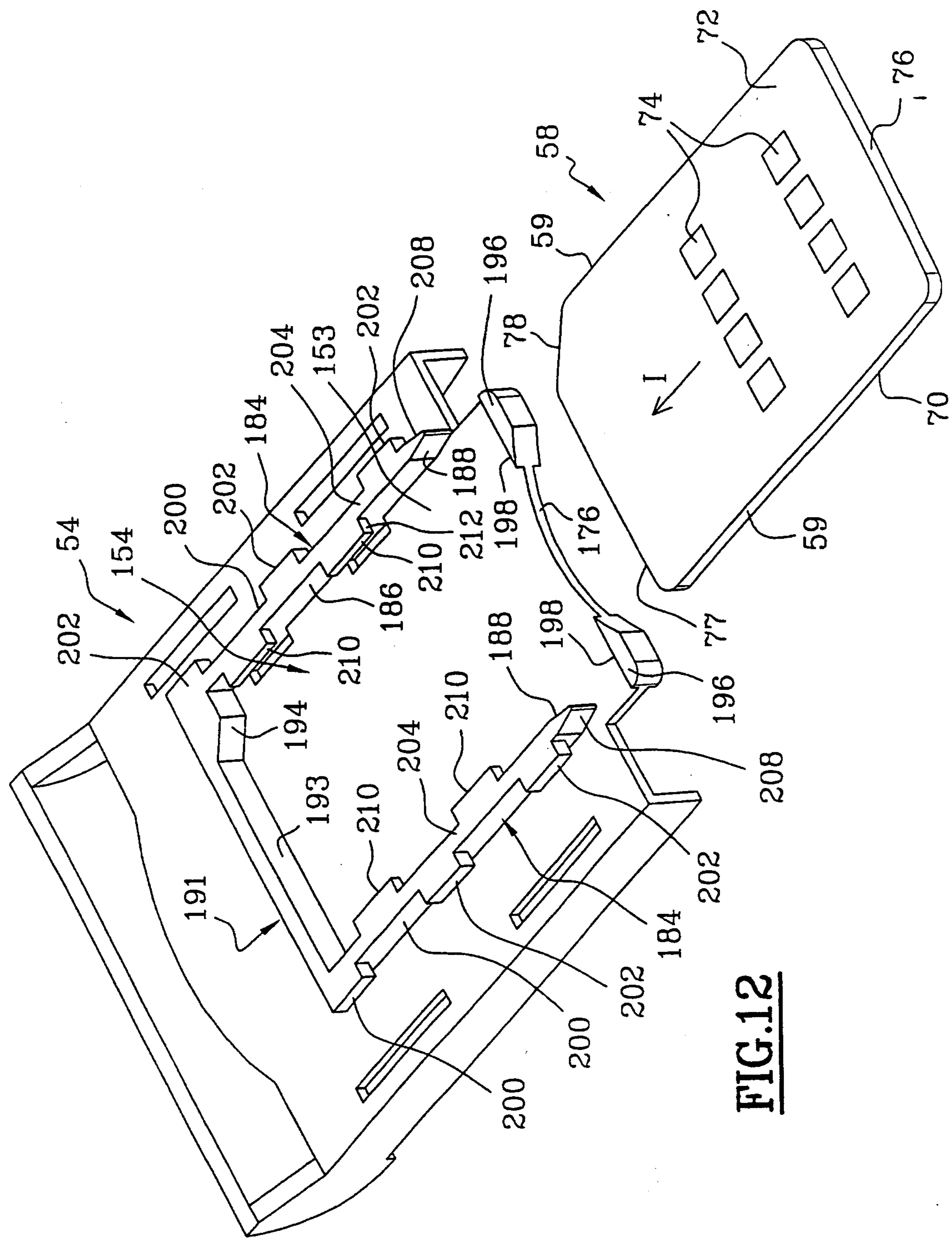
56
64
57
170
54
66
160
172
54
162
I
152
60
156
57
172
67
170
158
151

FIG.11


72
76
74
58
59
78
I
70
59
77
196
198
176
198
196
208
202
153
204
184
188
212
210
202
200
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191
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188
208
202
184
202
200
200

FIG.12

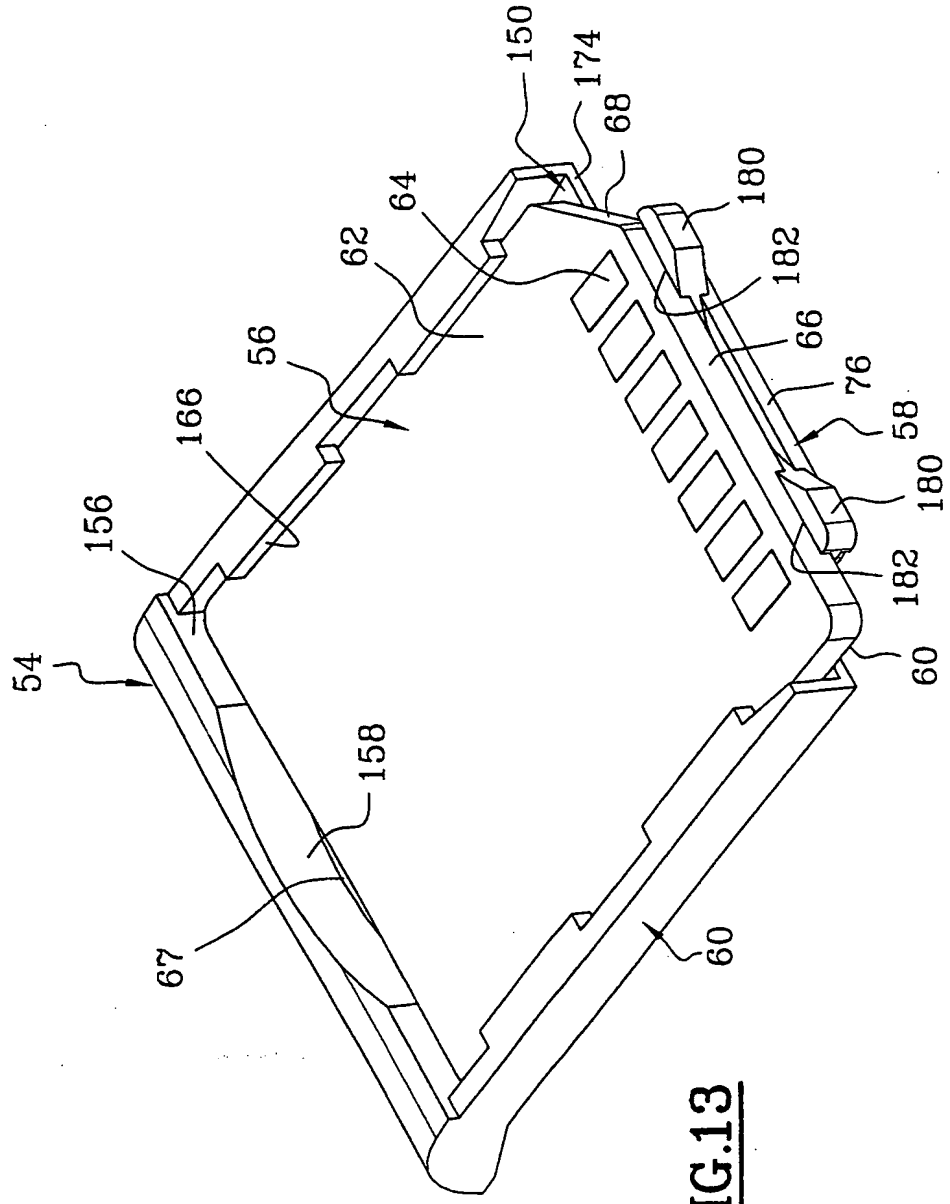


FIG.13

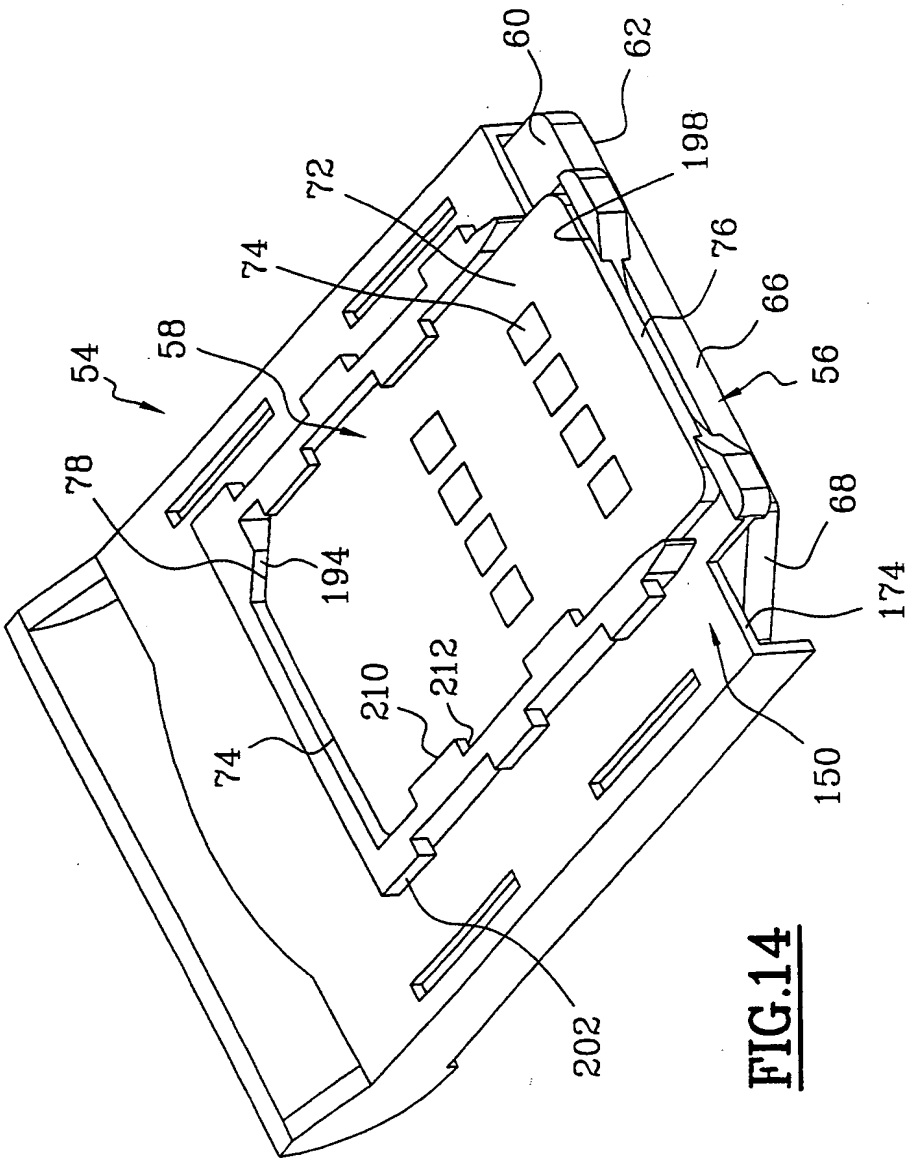


FIG.14

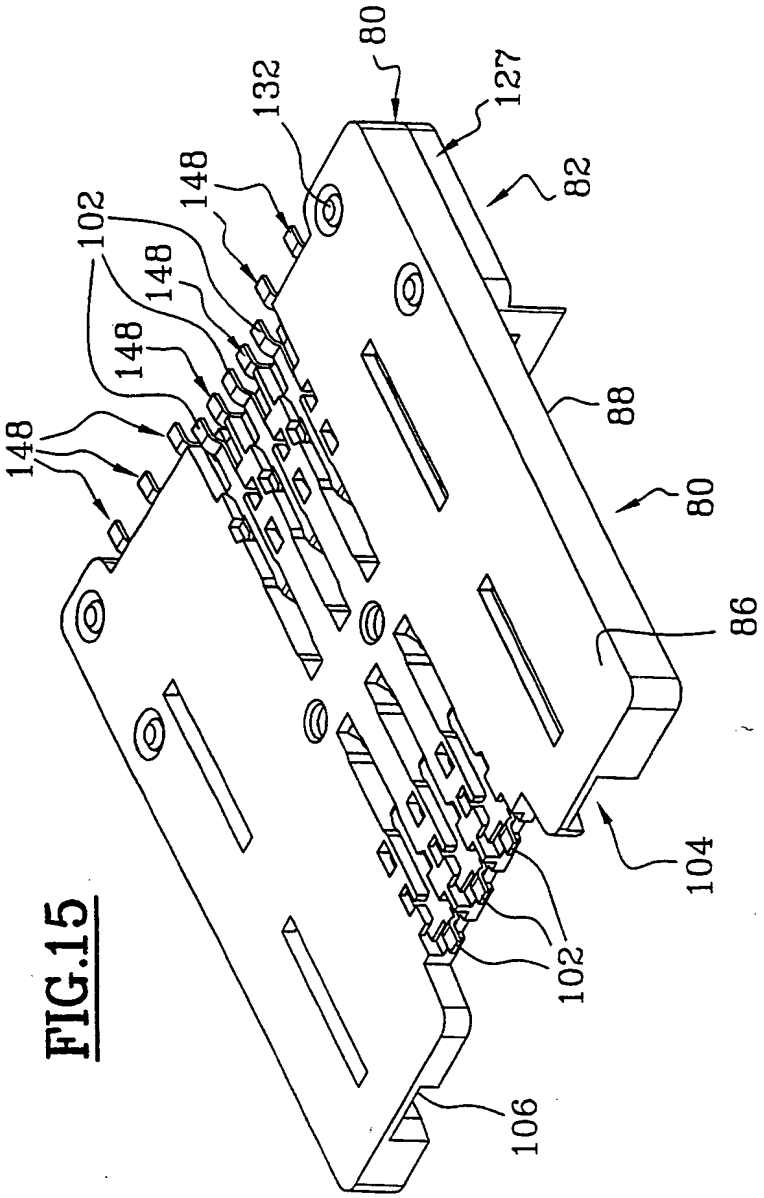
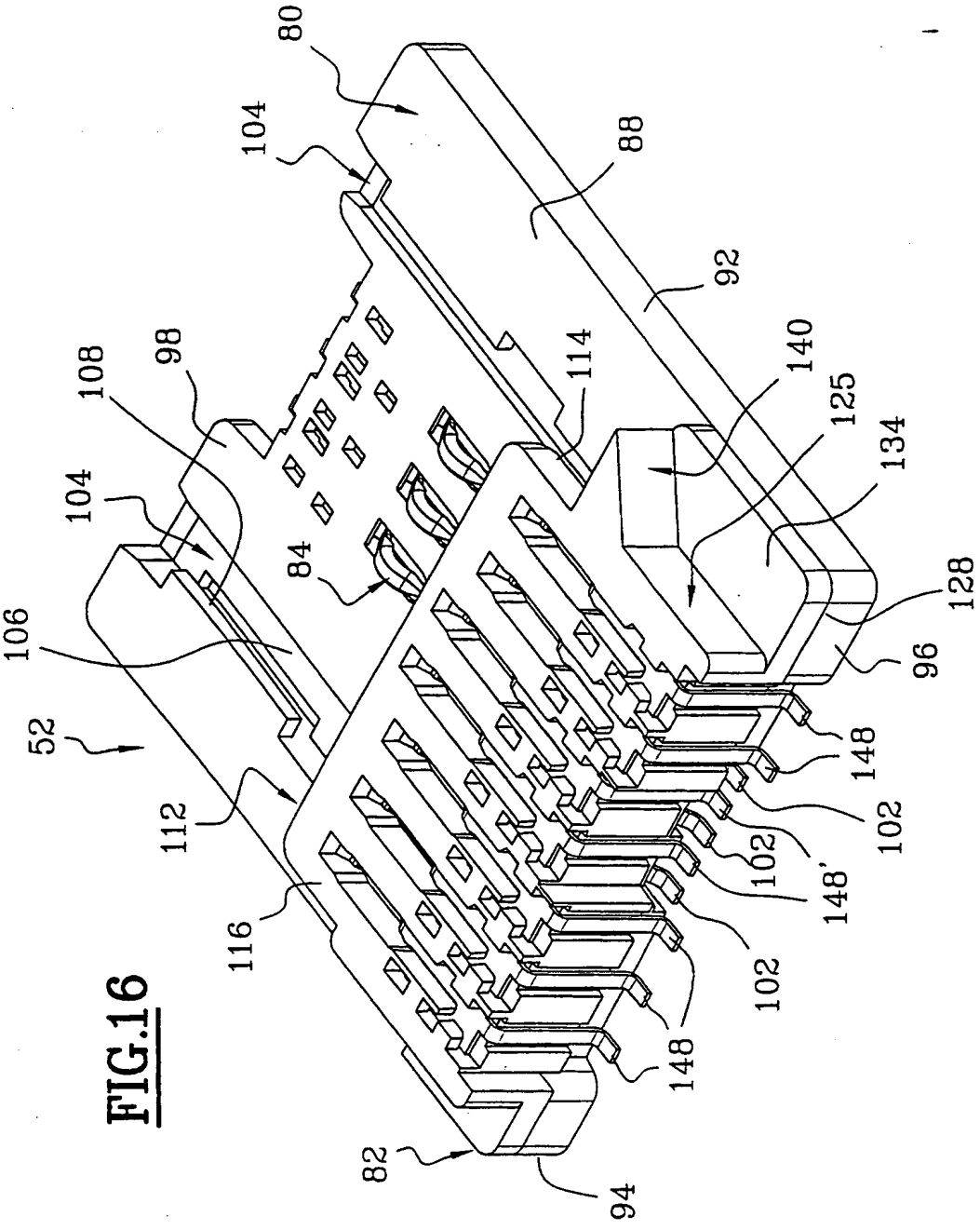


FIG.15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104
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92
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98
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125
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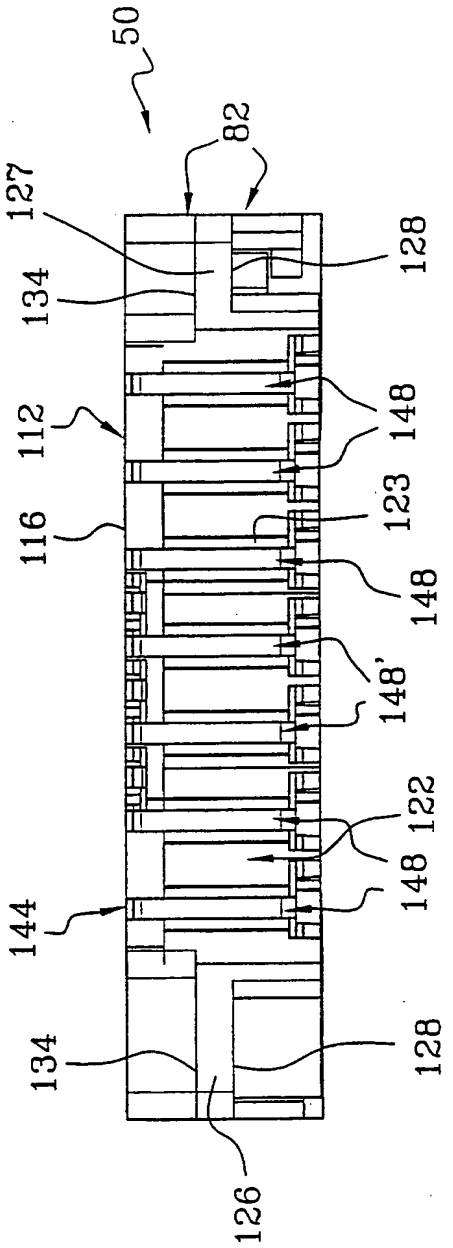
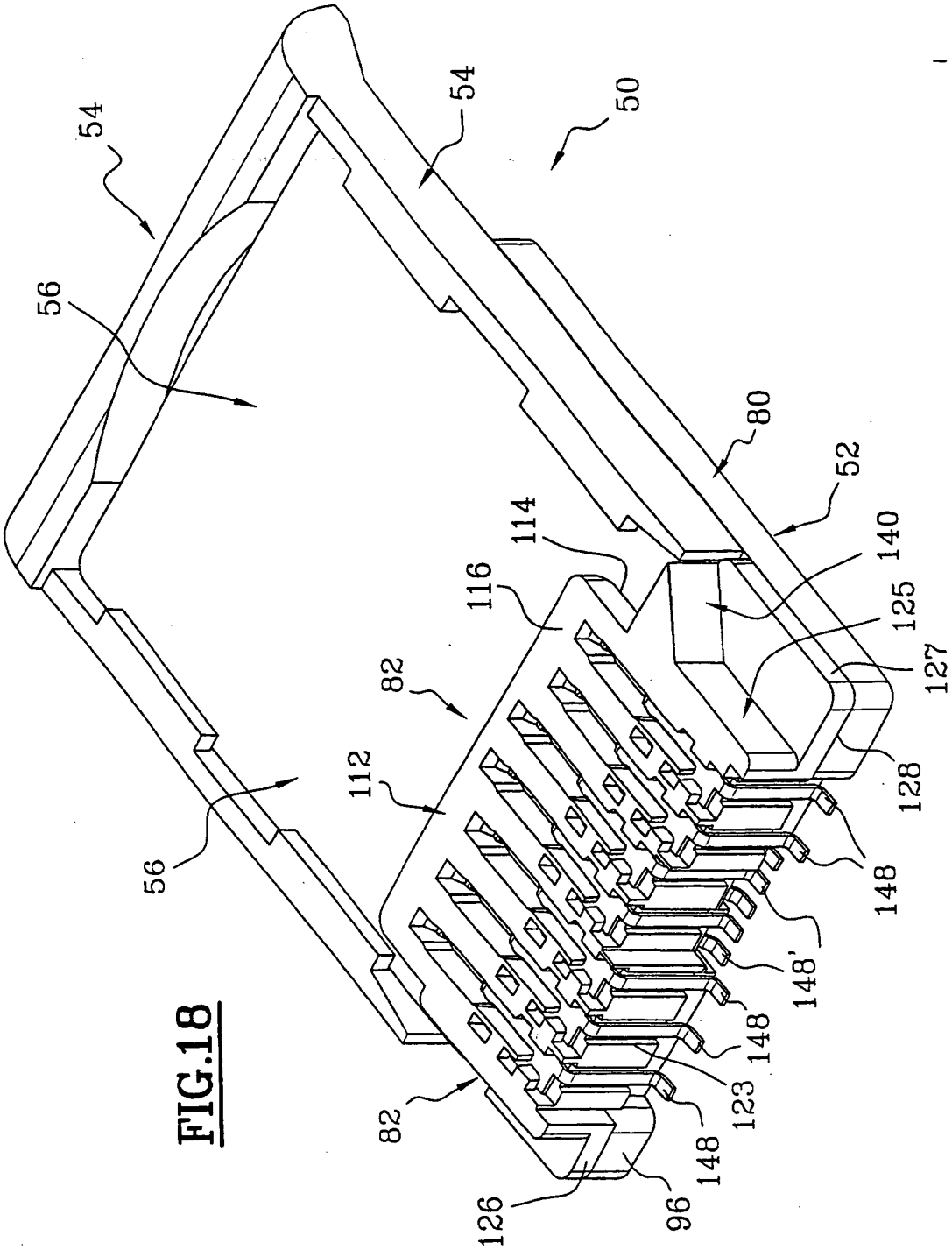
106
128
96
52
148
112
102
102
148'
116
102
148
82
94

FIG.16

FIG.17




54
54
50
56
80
52
114
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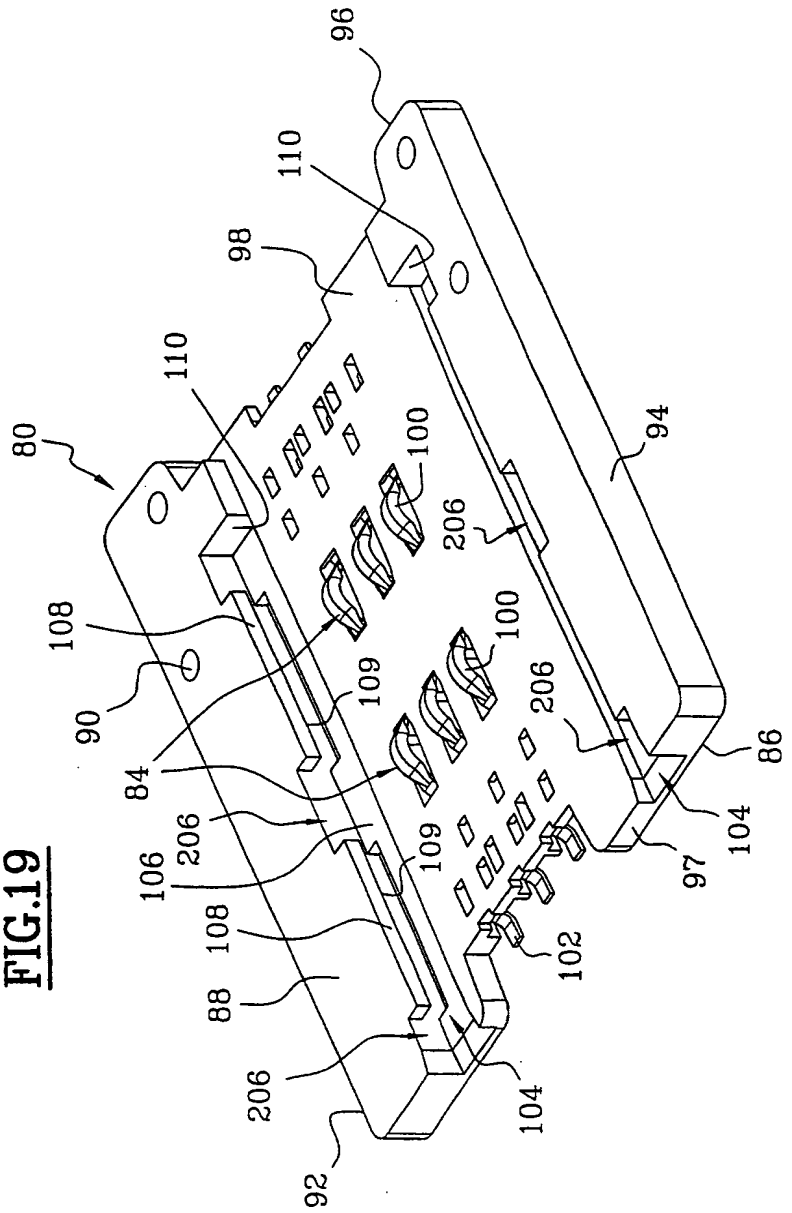
116
125
127
82
112
128
56
148
148'
148
123
82
148
126
96

FIG.18


96
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98
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80
100
94
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206
84
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206
109
104
106
97
108
102
88
206
104
92

FIG.19

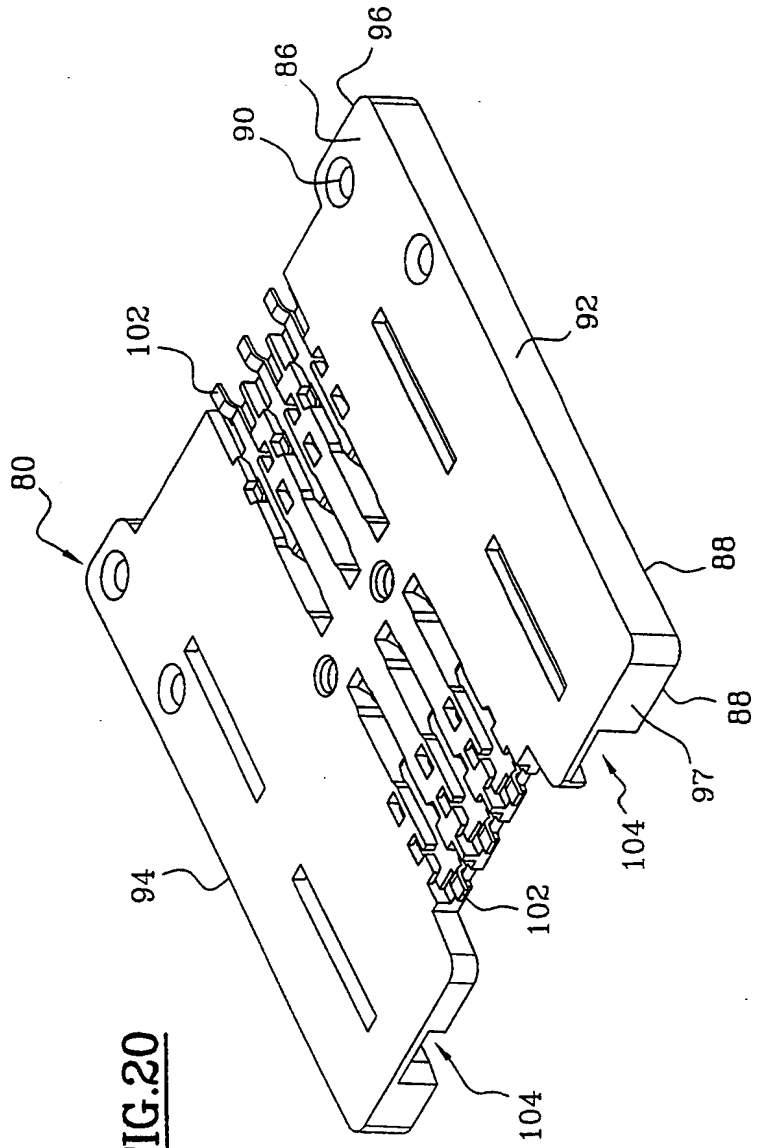
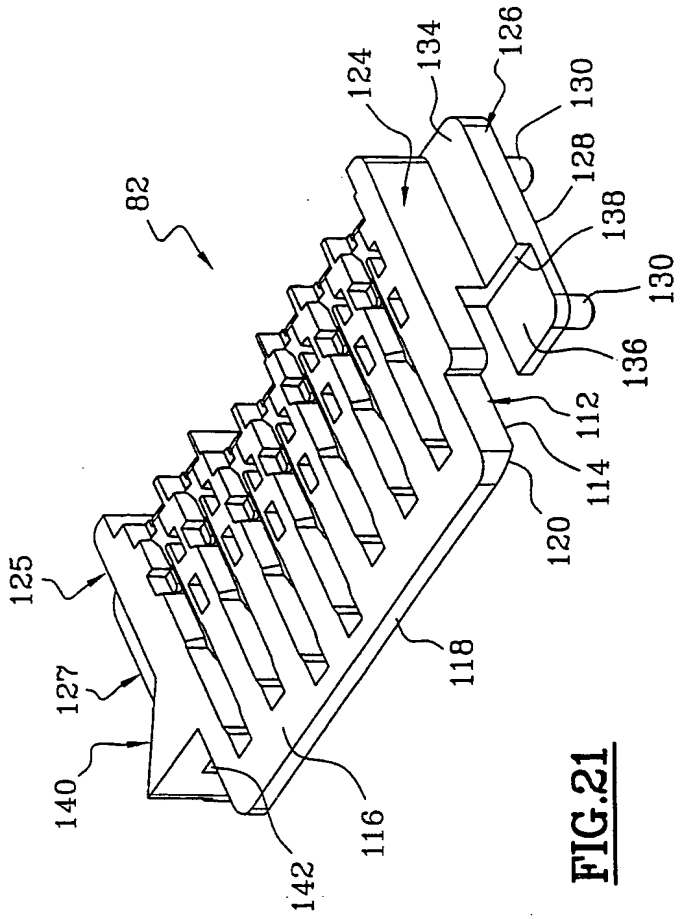


FIG.20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136
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120
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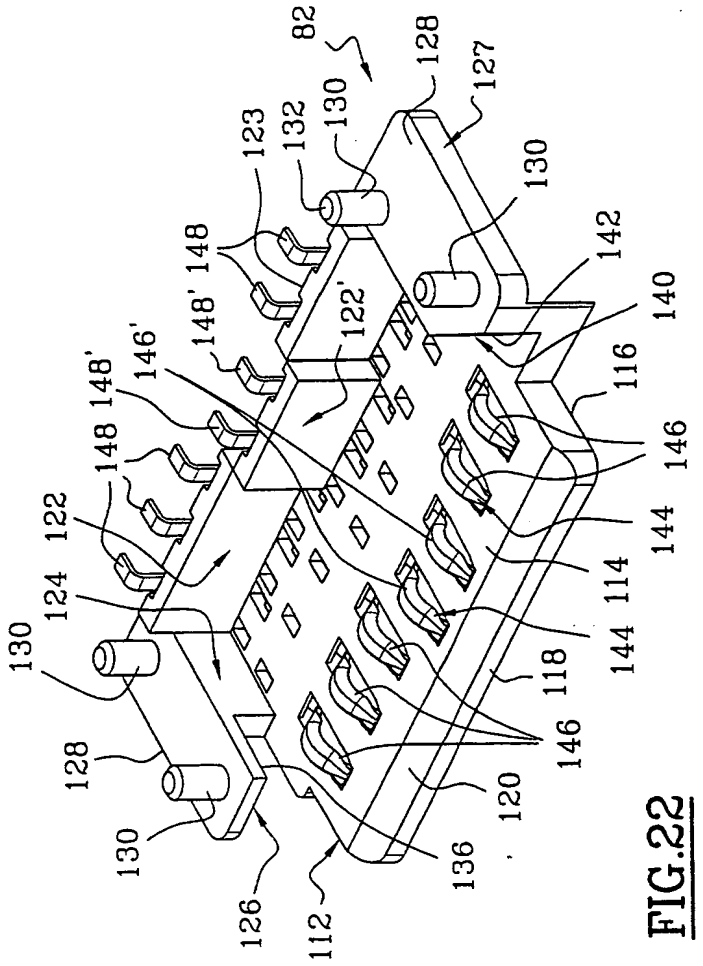
116
142

FIG.21


82
128
127
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123
132
130
148
148'
122'
142
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146'
148'
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128
146
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130
136
126
112

FIG.22

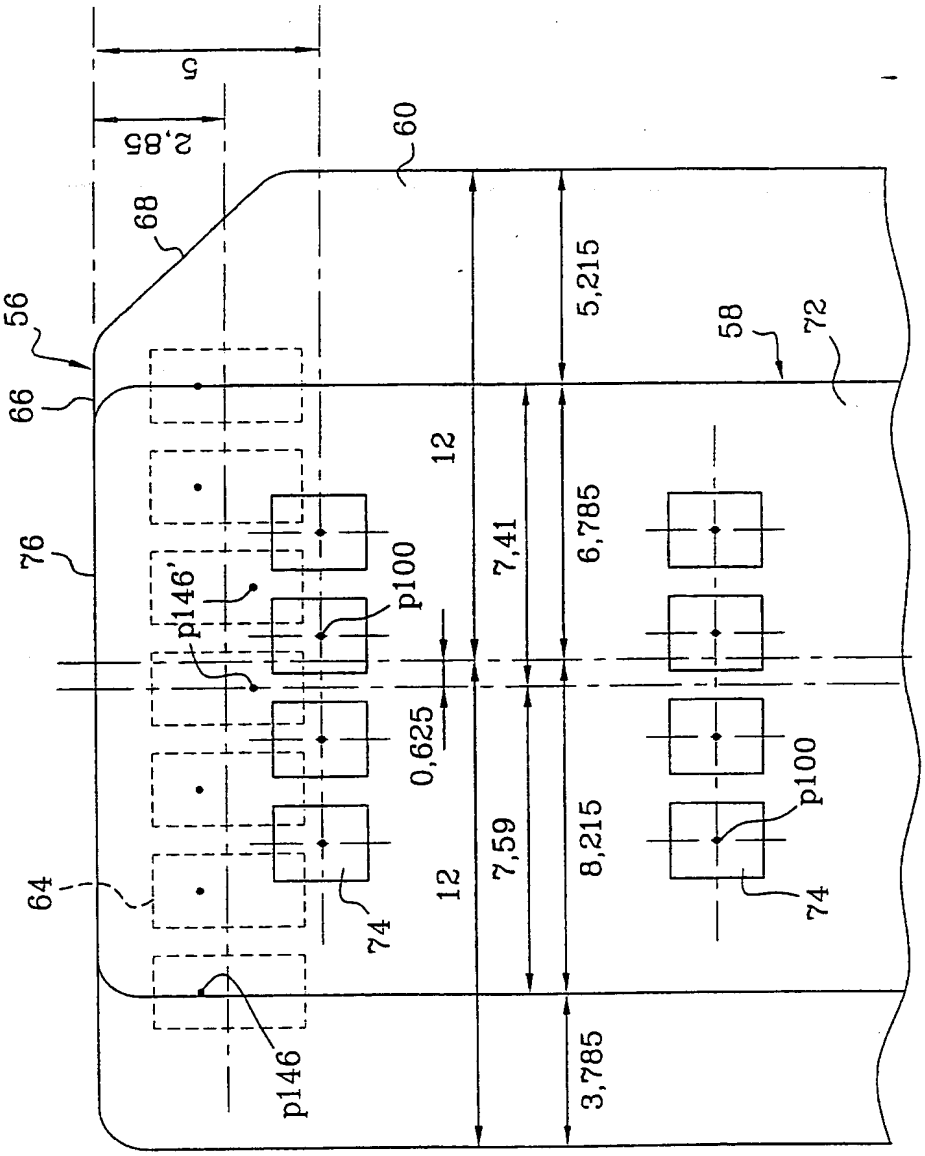

5
2,85
60
68
56
66
76
64
58
72
74
p146'
p100
p146
12
0,625
12
5,215
7,41
6,785
7,59
8,215
3,785

FIG.23

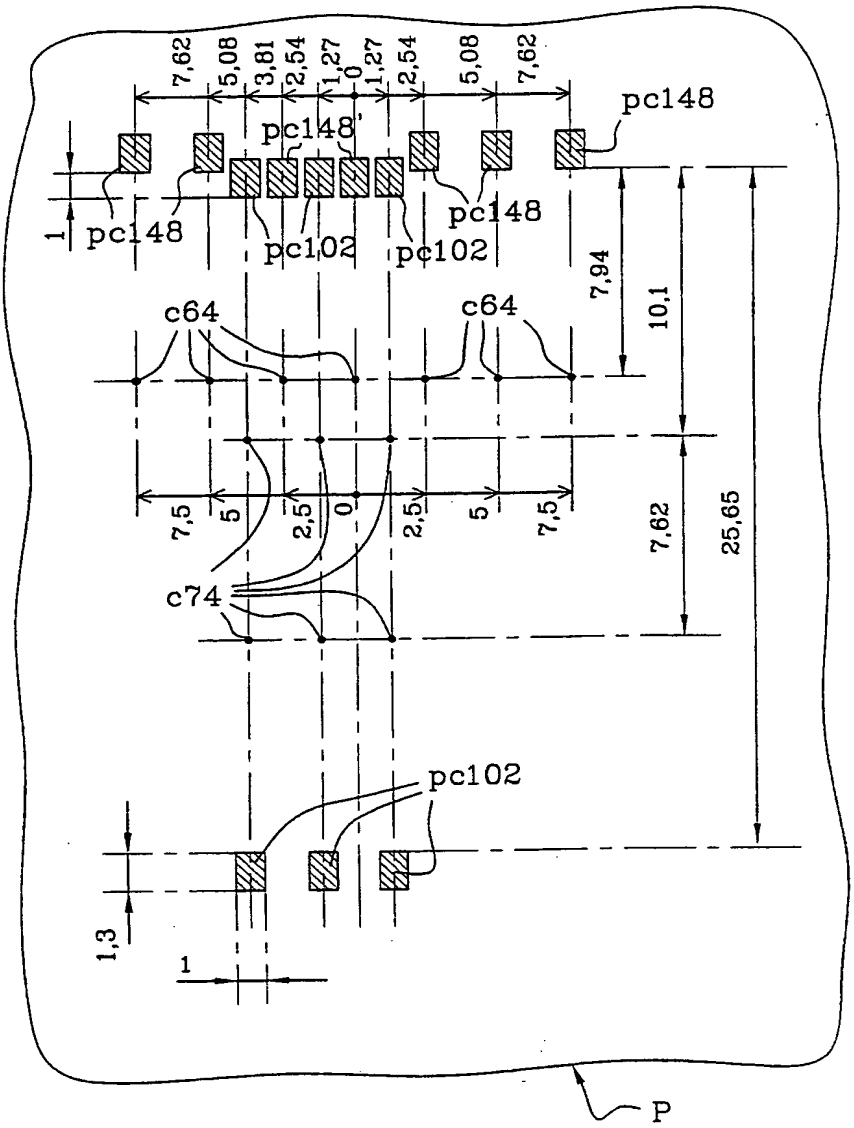

7,62
5,08
3,81
2,54
1,27
0
1,27
2,54
5,08
7,62
pc148
pc148'
pc148
pc148
pc102
pc102
1
7,94
10,1
c64
c64
7,5
5
2,5
0
2,5
5
7,5
7,62
25,65
c74
pc102
1,3
1
P

FIG.24

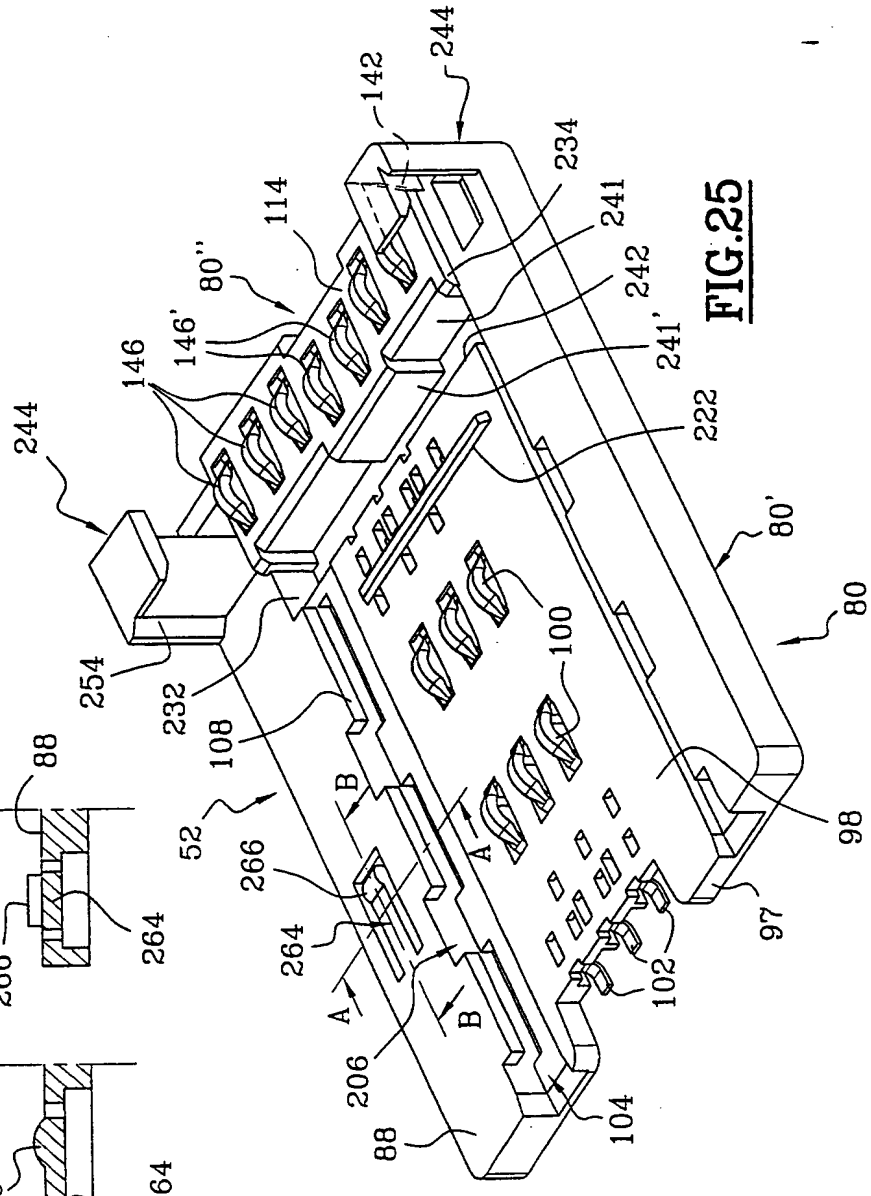


FIG.25

FIG.25A

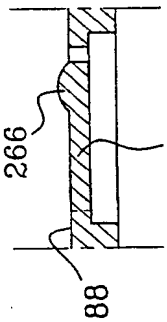
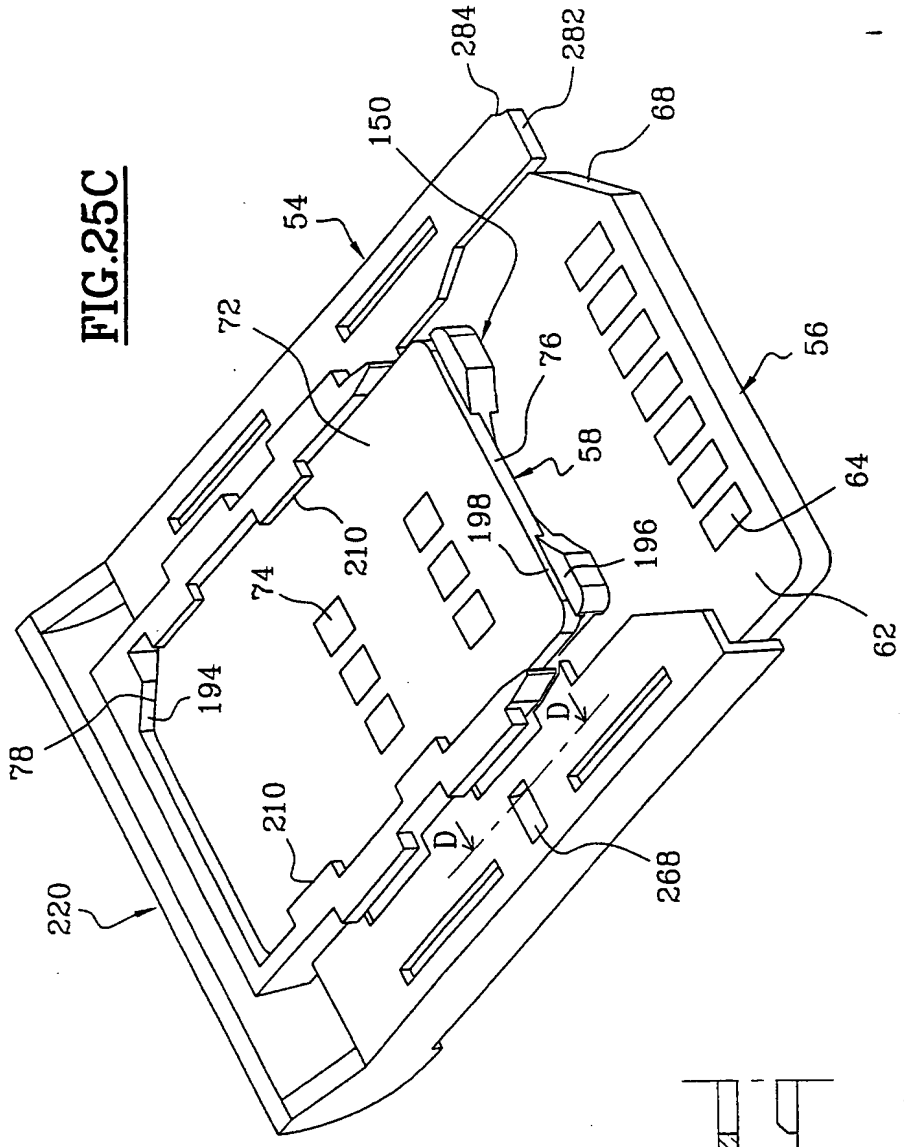


FIG.25B

FIG.25C



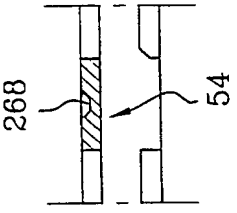


FIG.25D

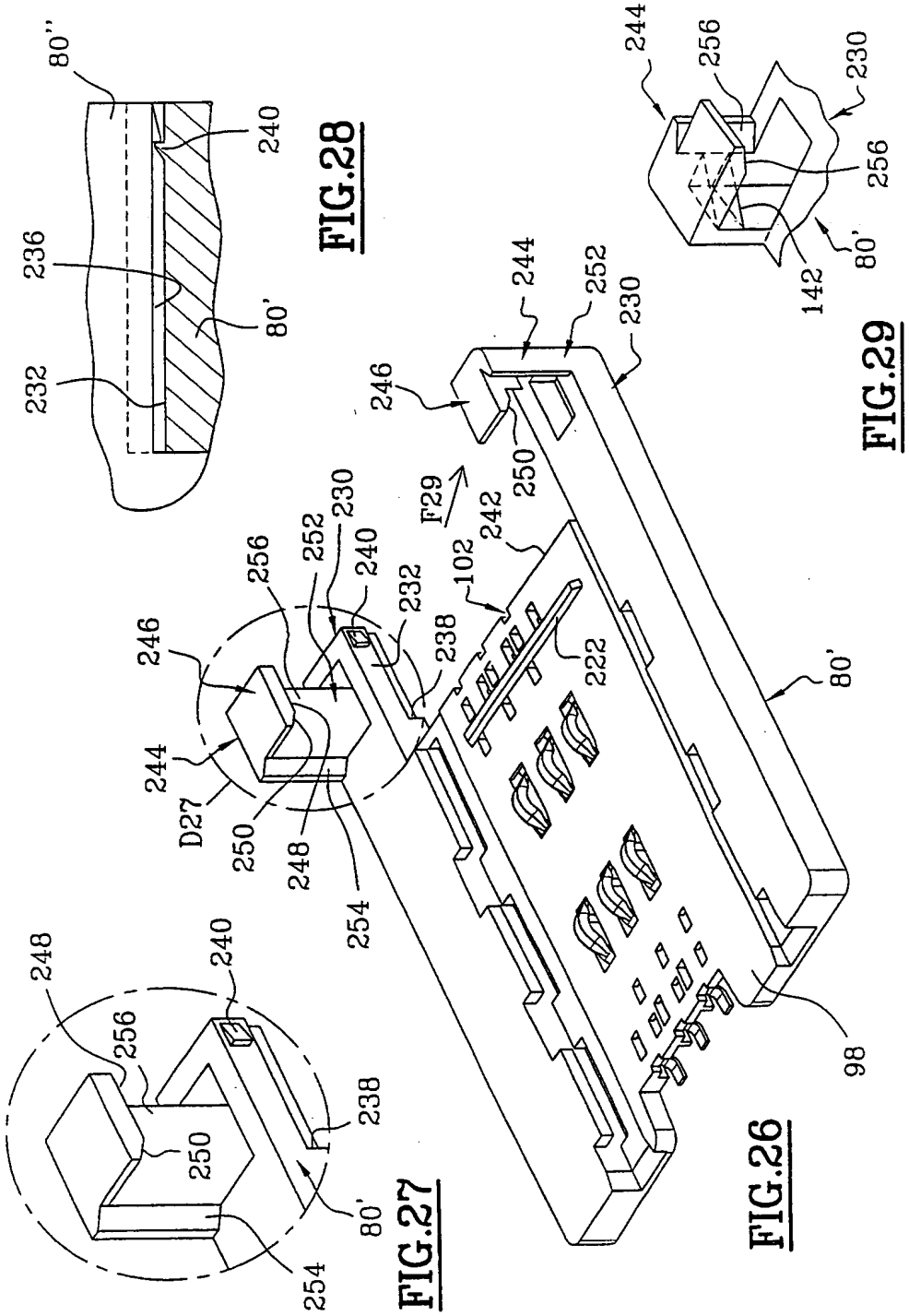


FIG.28

FIG.29

FIG.26

FIG.27

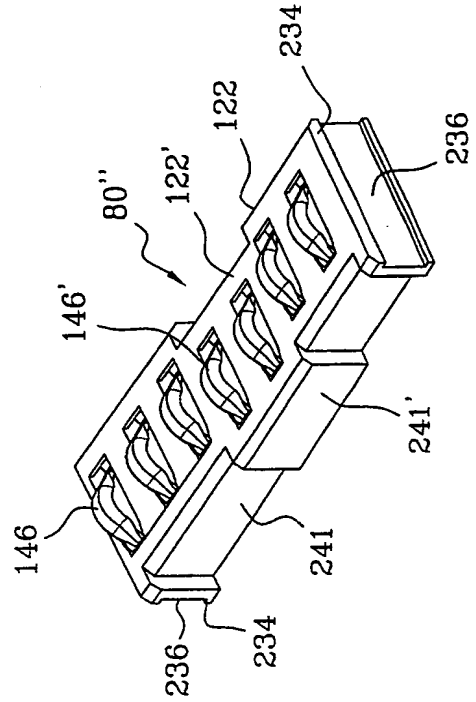


FIG.30

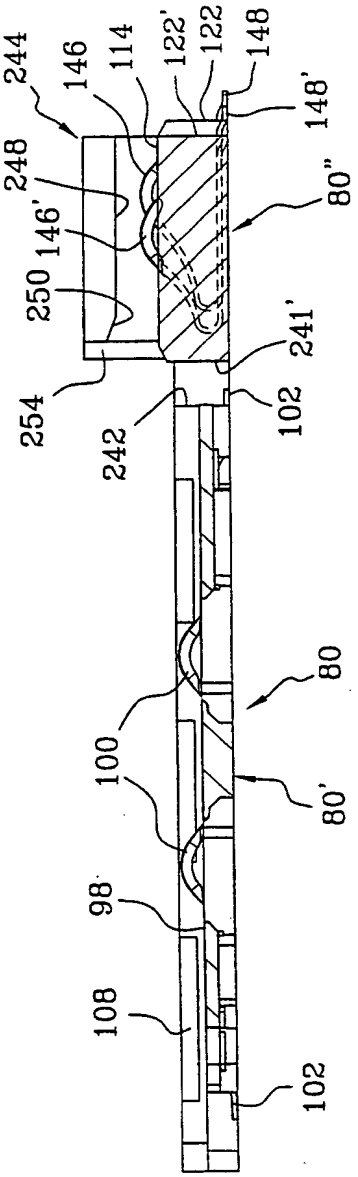

244
146
114
122'
122
148
148'
248
80"
146'
250
241'
254
242
102
80
100
80'
98
108
102

FIG.31

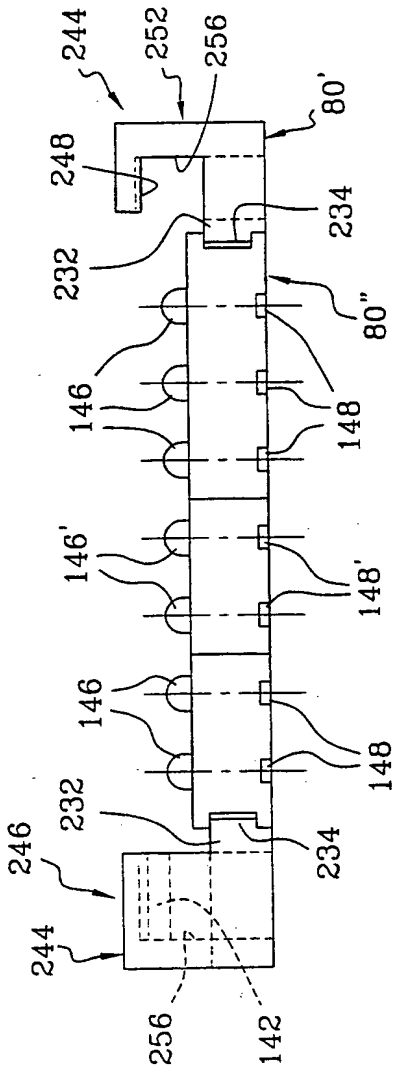

244
252
256
80'
248
234
232
80"
146
148
146'
148'
146
148
232
234
246
244
256
142

FIG.32

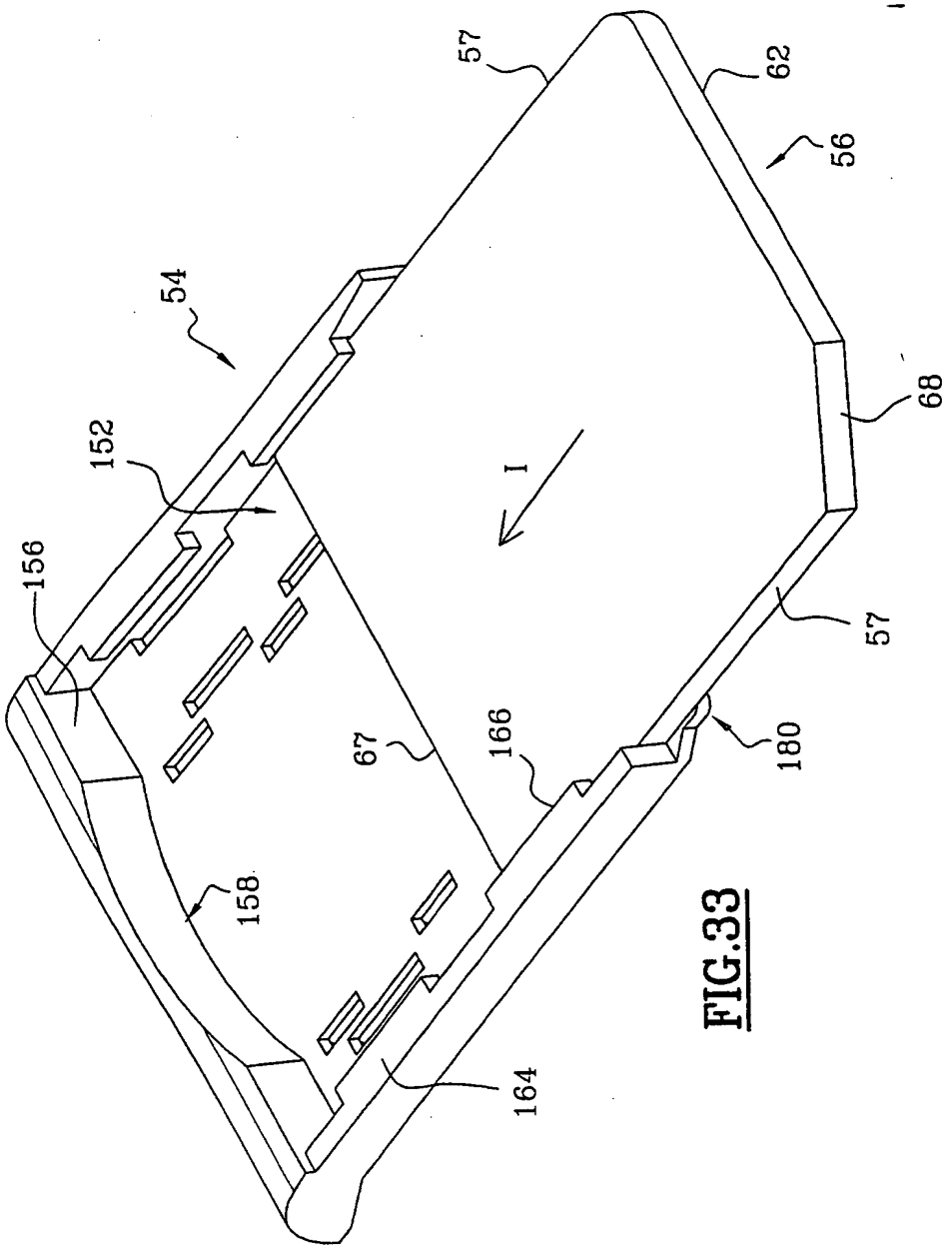


FIG.33

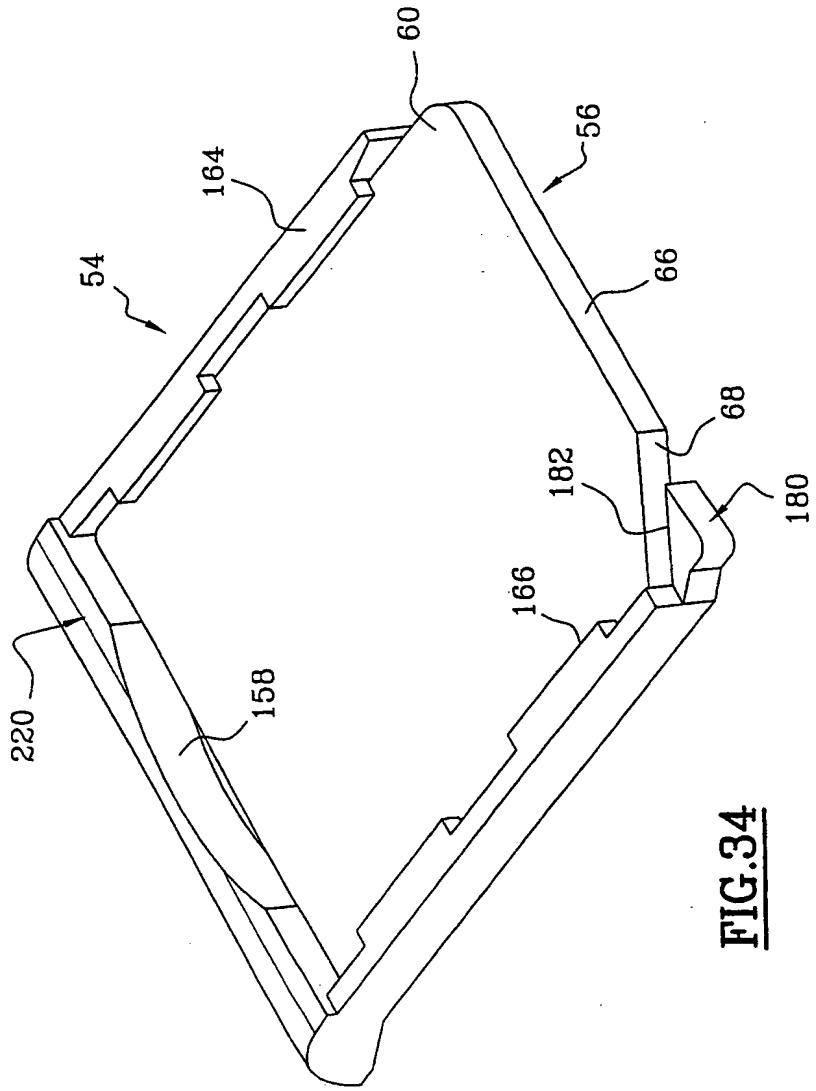


FIG.34

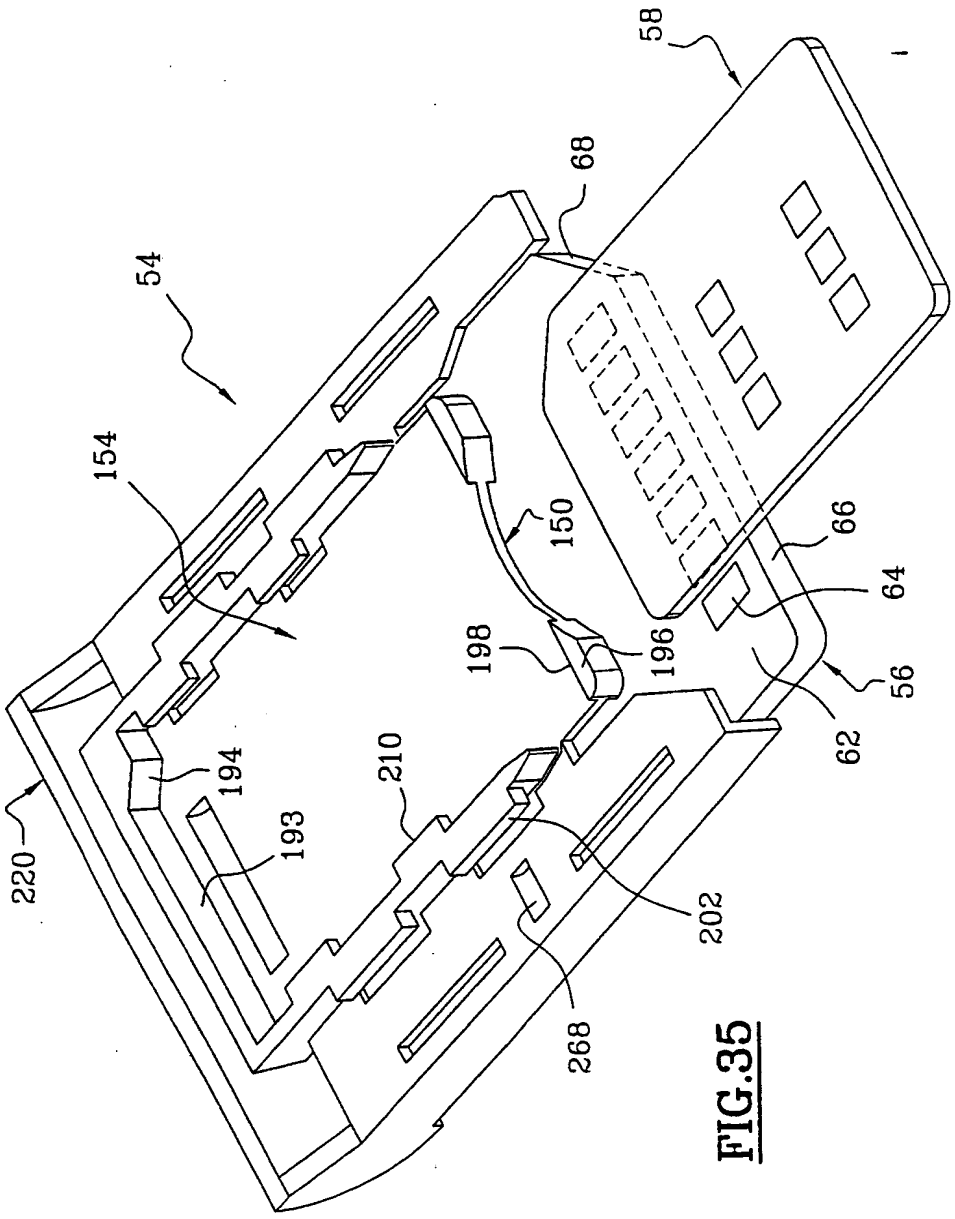


FIG.35

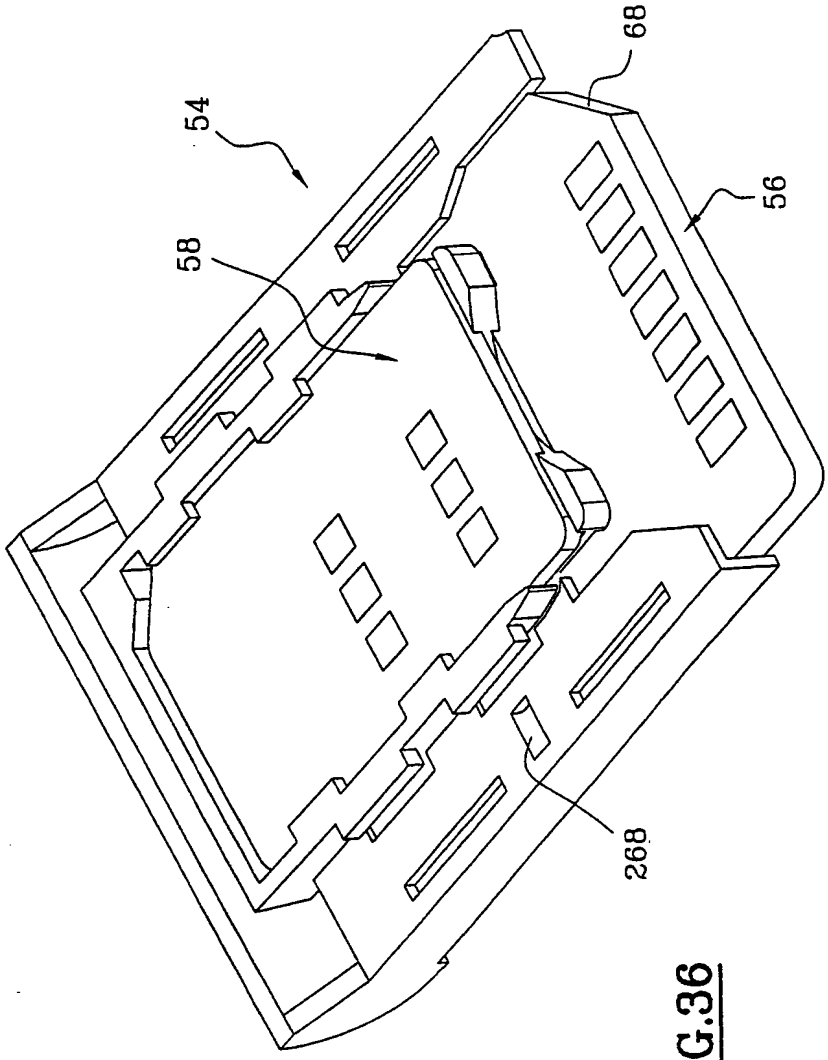
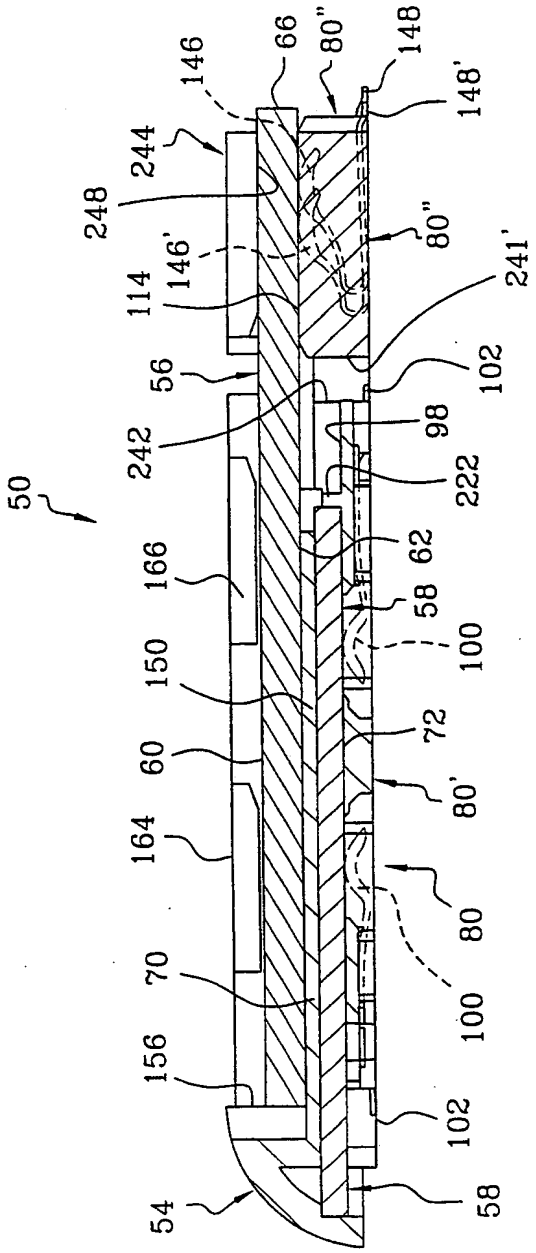


FIG.36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54
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62
66
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72
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80'
80"
80"
98
100
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102
114
146
146'
148
148'
150
156
164
166
222
241'
242
244
248

FIG.37

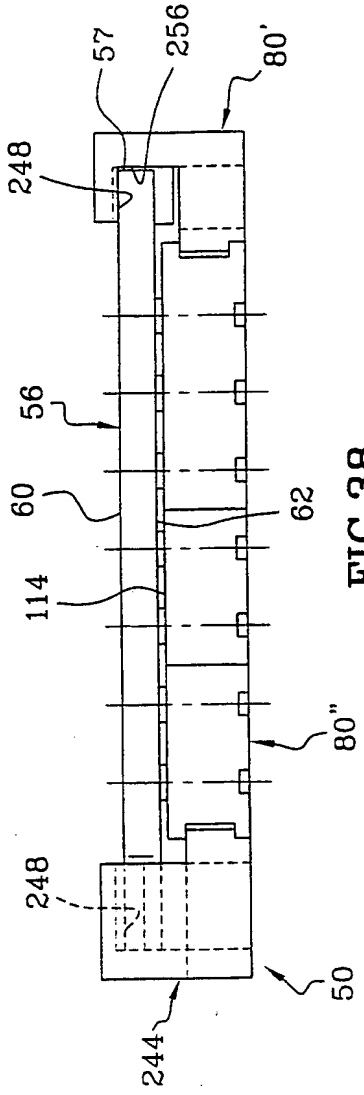

FIG.38

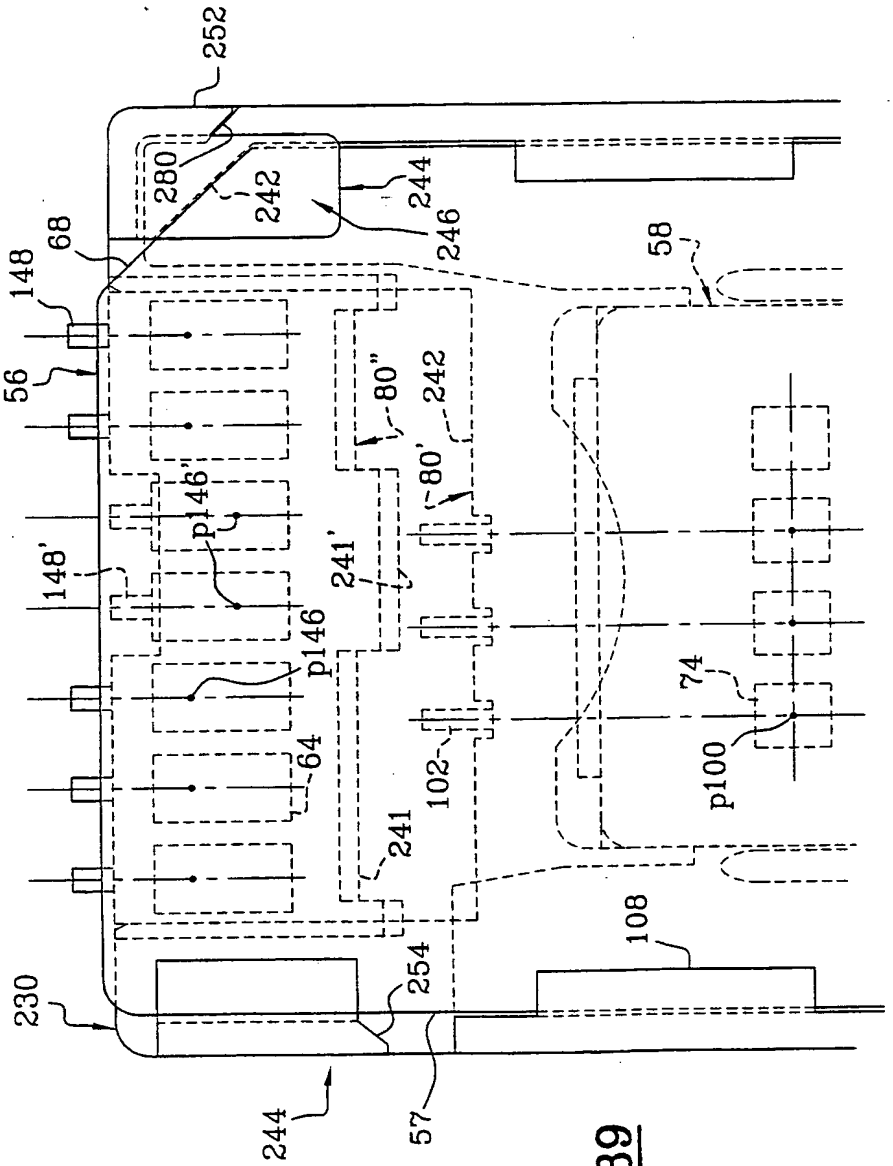
252
280
242
244
246
68
148
58
56
80"
242
80'
p146"
148'
241'
p146
74
64
102
p100
241
108
254
230
244
57

FIG.39

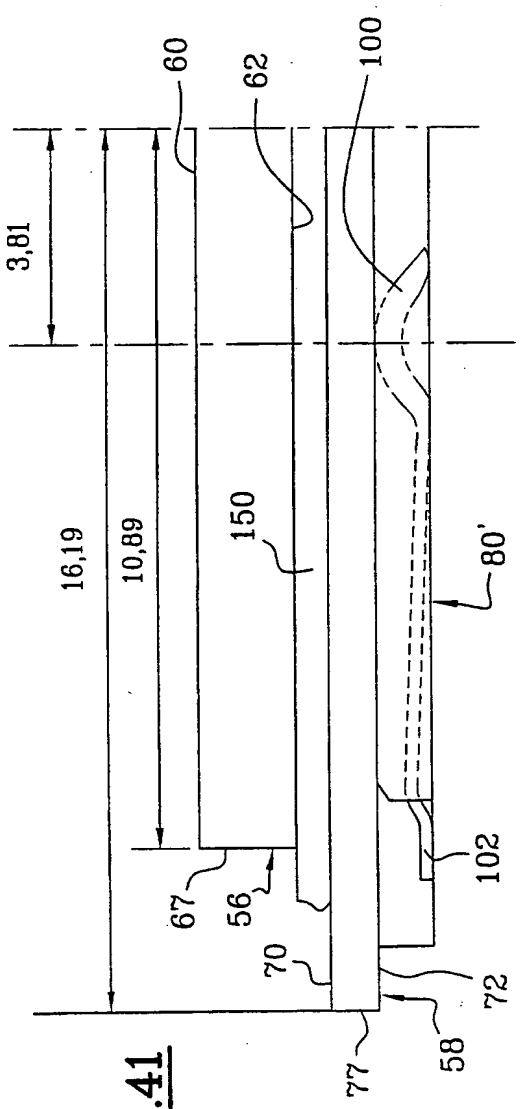
3,81
16,19
10,89
60
62
100
150
80'
102
67
56
70
72
58
77

FIG.41

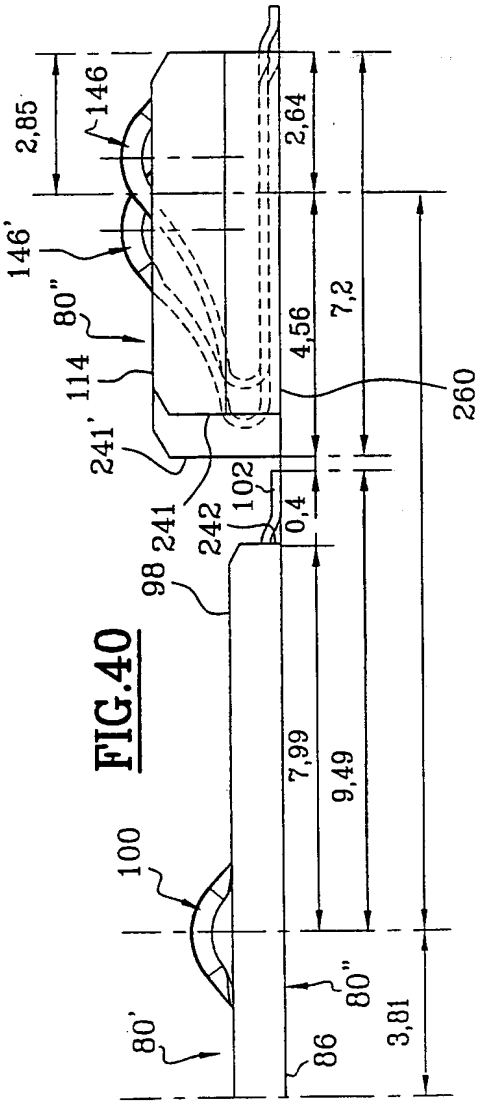
2,85
146
2,64
146'
80"
114
241'
4,56
7,2
260
102
242
241
0,4
98
7,99
9,49
100
80"
80'
86
3,81

FIG.40

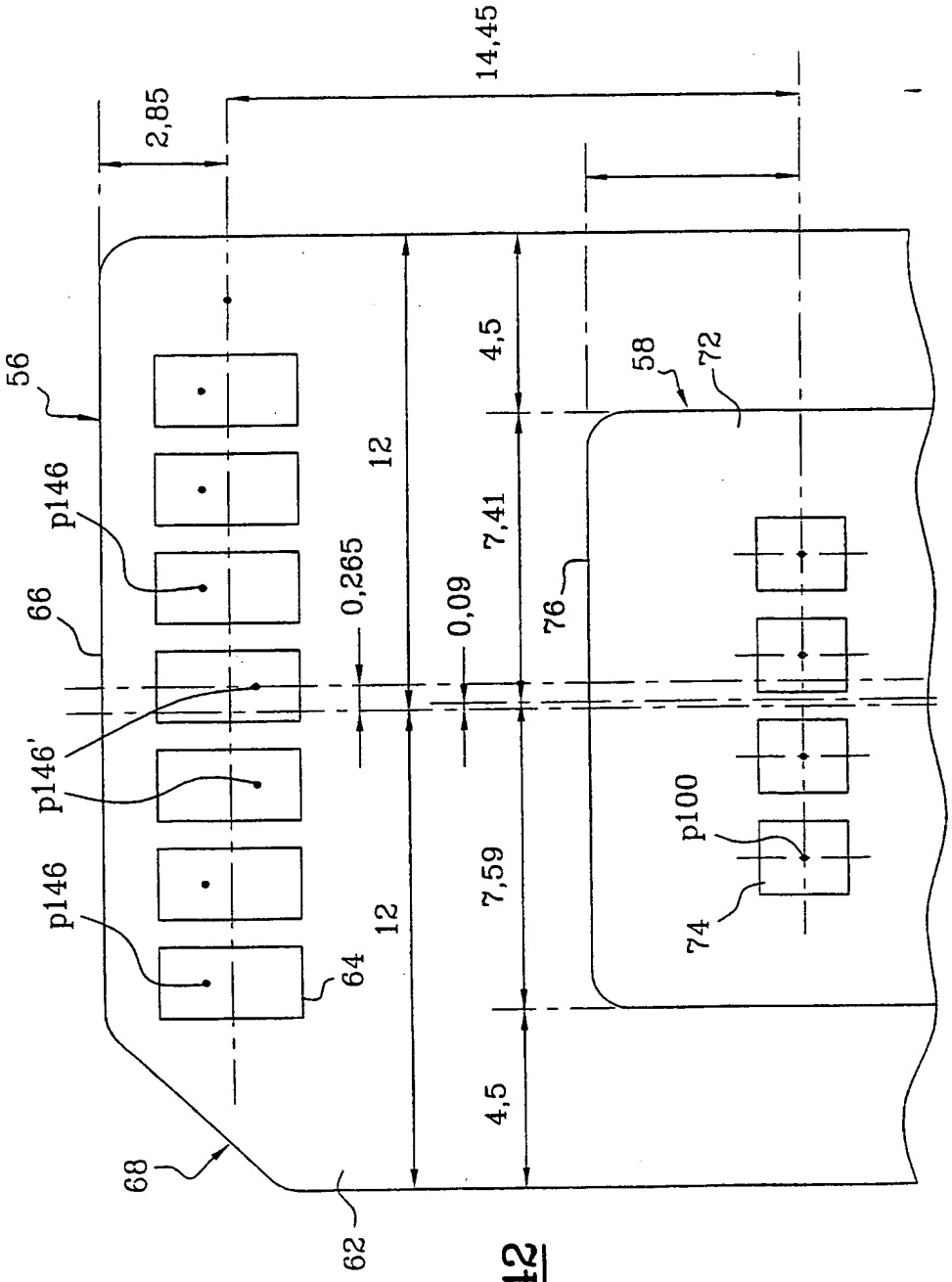
14,45
2,85
56
p146
66
p146'
p146
68
62
64
12
0,265
12
0,09
4,5
7,41
7,59
4,5
76
58
72
p100
74

FIG.42

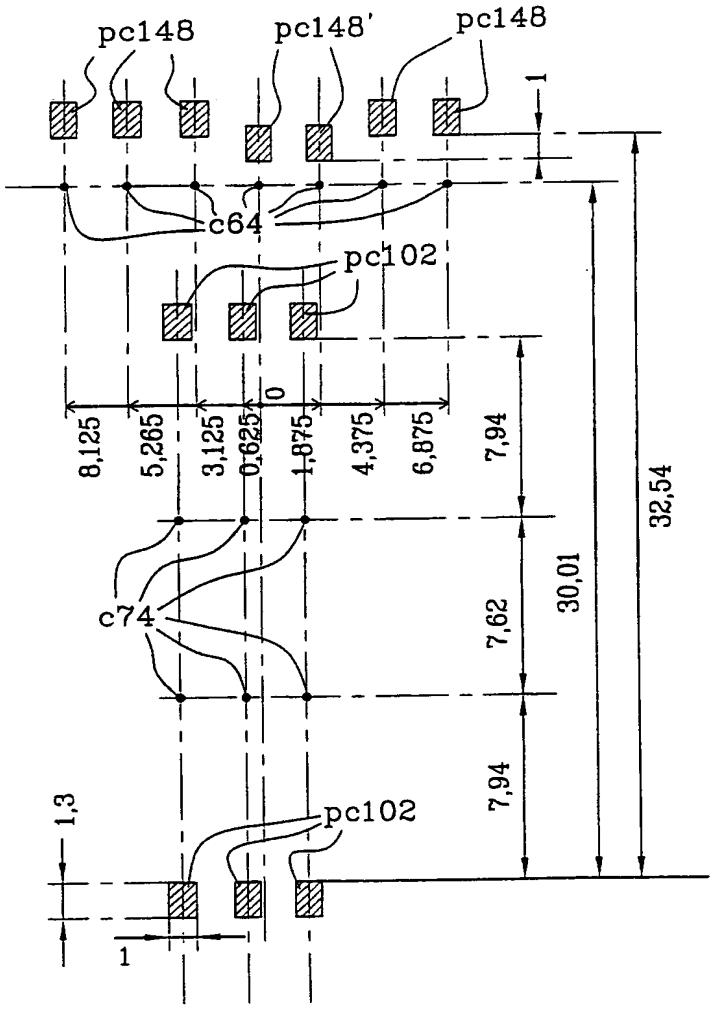
pc148
pc148'
pc148
1
c64
pc102
8,125
5,265
3,125
0,625
0
1,875
4,375
6,875
7,94
32,54
30,01
c74
7,62
7,94
1,3
pc102
1

FIG.43

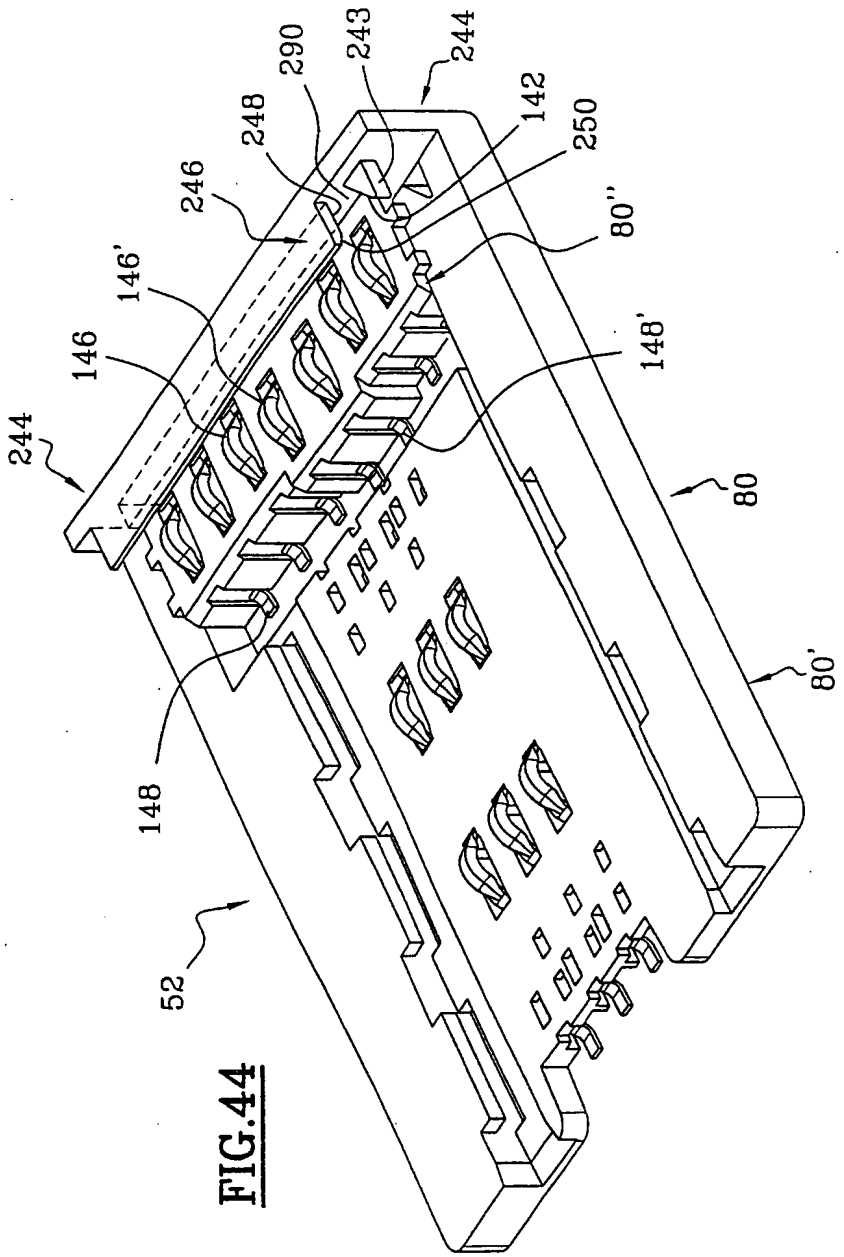

FIG.44

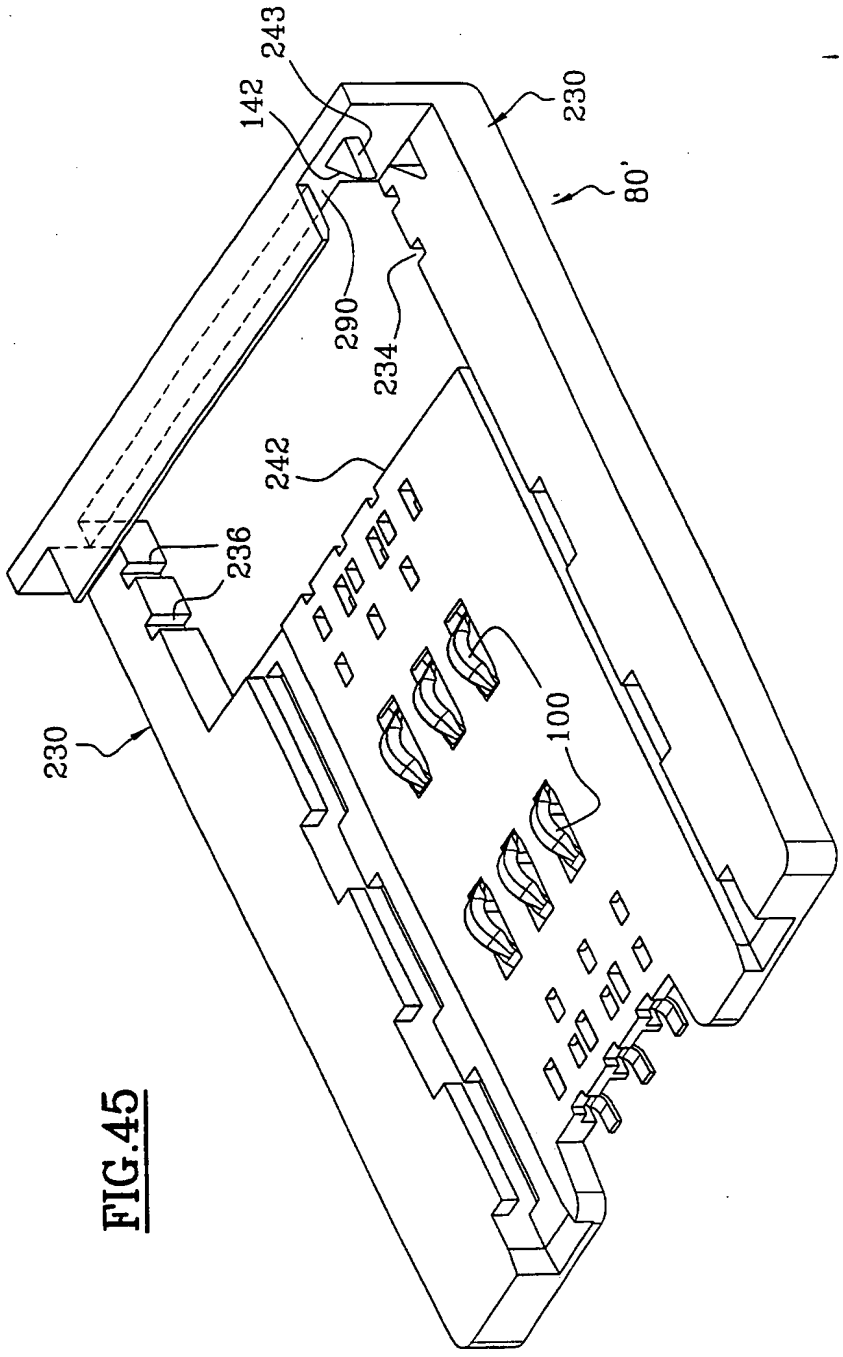

FIG.45

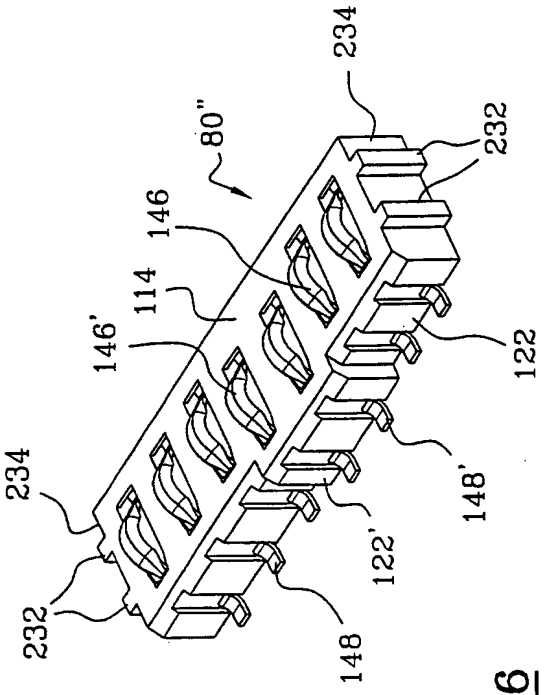

FIG.46

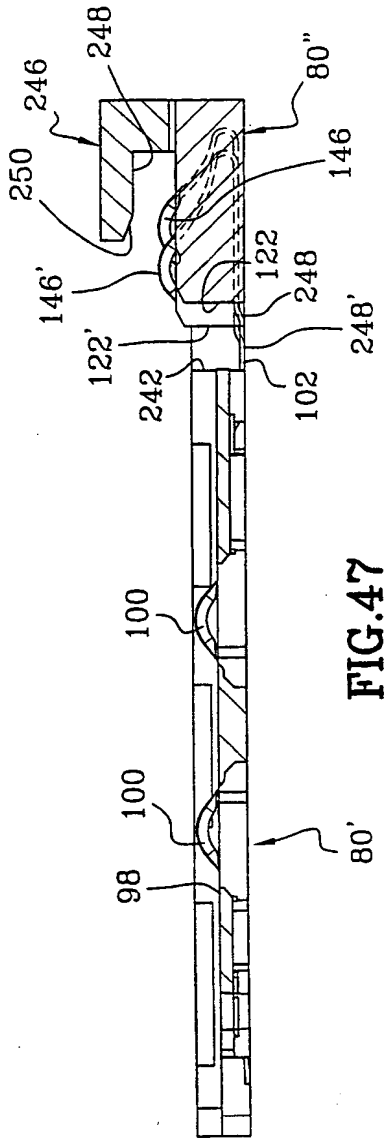

FIG.47

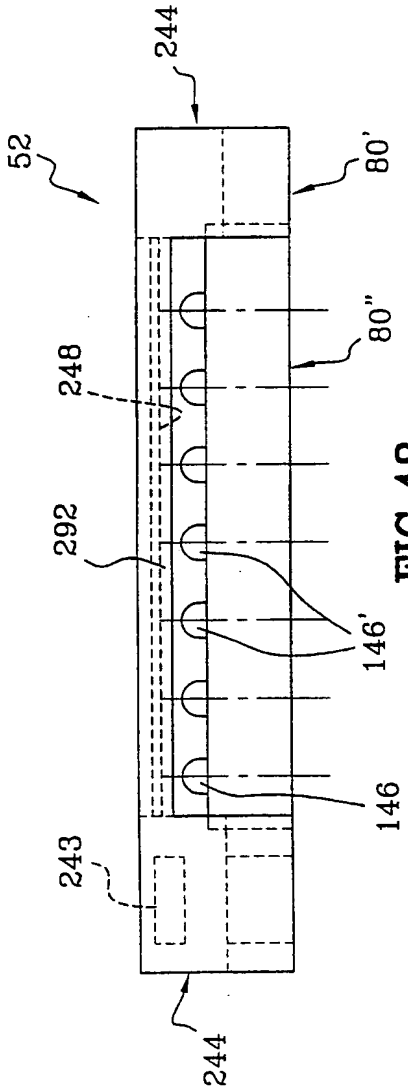

FIG.48